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BOTANICAL SERIES

FIELD MUSEUM OF NATURAL HISTORY
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VOLUME XVII NUMBER 1

THE NORTH AMERICAN SPECIES OF RUMEX

BY

K. H. RECHINGER, JR.
NATURAL HISTORY MUSEUM, VIENNA

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B. E. DAHLGREN
CHIEF CURATOR, DEPARTMENT OF BOTANY
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THE NORTH AMERICAN SPECIES OF RUMEX[1]

K. H. Rechinger, Jr.

25 Sept. 1937 Mann

INTRODUCTION

Among the North American species of *Rumex* are the following described by Linné: *R. Acetosa, R. Acetosella, R. alpinus, R. Britannica, R. bucephalophorus, R. crispus, R. dentatus, R. maritimus, R. obtusifolius, R. persicarioides, R. pulcher, R. sanguineus,* and *R. verticillatus.* Only four of these species are indigenous: *R. Acetosa, R. Britannica, R. persicarioides,* and *R. verticillatus.* All the others are introduced from Europe, except *R. dentatus,* which is originally from Asia, and most of them only a short time ago. The group of *R. salicifolius,* so characteristic for North America, is not represented among the Linnaean species.

The genus *Rumex* has been monographed only twice as a whole, by Campdera, in 1819, and by Meisner apud De Candolle, in 1856.

Campdera cites twelve species as occurring in North America: *R. persicarioides* L., *R. obtusifolius* L., *R. crispatulus* Michx., *R. sanguineus* L., *R. Kunthii* Campd., *R. verticillatus* L., *R. Claytoni* Campd., *R. aquaticus* L., *R. Acetosella* L., *R. venosus* Pursh, *R. crispus* L., and *R. ludovicianus* Raf. Three of them are indigenous, one confused, four introduced, one a synonym, and three doubtful.

Meisner notes twenty-two North American species and one hybrid: *R. aquaticus* L., *R. venosus* Pursh, *R. longifolius* DC., *R. crispus* L., *R. Kunthianus* Schult. f., *R. mexicanus* Meisn., *R. Berlandieri* Meisn., *R. chrysocarpus* Mor., *R. floridanus* Meisn., *R. Britannica* L., *R. salicifolius* Weinm., *R. verticillatus* L., *R. conglomeratus* Murr., *R. sanguineus* L., *R. obtusifolius* L., *R. crispo-obtusifolius* Meisn., *R. brevipes* Meisn., *R. persicarioides* L., *R. crispatulus* Michx., *R. maritimus* L., *R. Acetosella* L., *R. Engelmanni* Meisn., and *R. Acetosa* L. Ten of the species are indigenous, six introduced, two synonyms, two confused, and two doubtful.

Trelease in 1892 published a *Revision of the species of Rumex occurring north of Mexico.* He mentions twenty-one species: *R. Acetosella* L., *R. hastatulus* Baldw., *R. Geyeri* (Meisn.) Trel., *R.*

[1] Vorarbeiten zu einer Monographie der Gattung Rumex V. Previous numbers of the series have been published as follows: I. Beih. Bot. Centralbl. 49, Abt. 2. Dresden, 1932. II. Repert. Sp. Nov. 31. Berlin, 1933. III. Arkiv Bot. 26A, No. 3. Stockholm, 1933 (South American species). IV. Oesterr. Bot. Zeitschr. 84. Wien, 1935 (Australian species).

Acetosa L., *R. venosus* Pursh, *R. hymenosepalus* Torr., *R. occidentalis* Wats., *R. Patientia* L., *R. Britannica* L., *R. crispus* L., *R. verticillatus* L., *R. floridanus* Meisn., *R. altissimus* Wood, *R. salicifolius* Weinm., *R. Berlandieri* Meisn., *R. conglomeratus* Murr., *R. sanguineus* L., *R. pulcher* L., *R. obtusifolius* L., *R. persicarioides* L., and *R. bucephalophorus* L.

Since Trelease's paper there have been published fourteen other North American species and some varieties, all by American authors: (*R. Bakeri* Greene), (*R. confinis* Greene), *R. densiflorus* Osterh., *R. fascicularis* Small, *R. fenestratus* Greene, (*R. gracilipes* Greene), *R. hesperius* Greene, *R. lacustris* Greene, (*R. Langloisii* Small), (*R. polyrhizus* Greene), *R. praecox* Rydb., (*R. procerus* Greene), (*R. salinus* A. Nels.), *R. spiralis* Small. The names in parentheses do not seem to me to be valid and appear in this paper as synonyms or varieties. Most of these species have been mentioned in their respective local floras, but for the most part no one has undertaken to define their systematic position, consequently a new general revision of the North American species of *Rumex* seems desirable.

In the present paper forty-nine species and four hybrids are recorded from North America, including Mexico, of which thirty-five species are indigenous and twelve introduced; as regards a few species it is not quite certain whether they are really introduced. Among the alien species are ten or eleven of European and Mediterranean origin, one from South America, and one from eastern Asia.

Special attention should be called to the fact that only three spontaneous hybrids are recorded from North America; in only one of them does an indigenous North American species take part, the two others being of introduced European parents. In striking contrast, there are known in Europe several dozens of hybrids, and many of them occur frequently wherever the parents grow together.

Thirty of the thirty-five indigenous North American species are endemic: that is, are not found naturally outside the continent. The range of the five remaining species is as follows: two are arctic-circumpolar (with interruptions), one (or perhaps two or three, since the question whether they are spontaneous in the New World is not solved) is widely spread over the temperate zone of the northern hemisphere, and one species ranges widely over North and South America, with wide interruptions in the tropical regions.

Seven species and one hybrid are described by me. A large part of the increase in number of species is due to division of the collective species *R. salicifolius* in the sense of earlier authors. By courtesy of

American institutions, I have been able to study extensive material, which has shown that the number of more or less distinct types in the relationship of *R. salicifolius* is rather large and that most of them are confined to definite areas. That these areas are natural ones, that is, correlated with climatic and geographic-geologic facts, is scarcely open to discussion, since similar areas have been defined frequently by American workers for genera not particularly susceptible to extraneous influences, such as that of man (see Fernald, Persistence of plants in unglaciated areas of Boreal America, Mem. Gray Herb. 2. 1925).

I acknowledge my great indebtedness to the directors of many American and European institutions and their staffs for liberal loans of important collections. A list of the herbaria follows:

Be. Botanisches Museum, Berlin-Dahlem, Germany.
Br. Botanisches Institut der Masaryk-Universität, Brünn.
Bu. Botanische Abteilung des National Museums, Budapest.
Ca. University of California, Berkeley.
Ch. Field Museum of Natural History, Chicago.
Cl. Botanisches Institut der Universität Cluj, Roumania.
Co. Columbia College, New York (containing the Meisner Herbarium).
De. Herbier Delessert, Conservatoire Botanique, Geneva.
G. Gray Herbarium, Cambridge.
H. Botanisches Staatsinstitut, Hamburg.
Ke. Royal Botanic Gardens, Kew.
Ko. Botanisches Museum der Universität, Copenhagen.
La. Rocky Mountain Herbarium, Laramie, Wyoming.
Le. Botanischer Hauptgarten, Leningrad.
Lu. Botanisches Museum, Lund, Sweden.
Mu. Botanisches Museum, Munich.
MW. Botanische Abteilung des Naturhistorischen Museums, Vienna.
NY. New York Botanical Garden, New York.
O. Herbarium of Geological Survey of Canada, Ottawa.
P. State College of Washington, Pullman.
St. Botanische Abteilung des Reichsmuseums, Stockholm.
SL. Missouri Botanical Garden, St. Louis.
Up. Botanisches Museum, Upsala.
Ut. Botanisches Museum, Utrecht.

UW. Botanisches Institut der Universtität, Vienna.
Wa. United States National Herbarium, Washington.
Z. Botanisches Museum der Universtität, Zürich.

Among the numerous friends who have aided in various ways in preparation of this work I thank especially Dr. Harold St. John for many most helpful suggestions regarding literature and location of American collections and for geographical data; Dr. Theodor Just, for photographs of Greene types; and Dr. Frida Rechinger for the drawings. J. Francis Macbride helped me kindly in matters of phraseology.

NATURAL ARRANGEMENT OF SPECIES

From my standpoint the indigenous and more important introduced American species of *Rumex* may be separated into the following subgenera, sections, and subsections:

SUBGEN. I. *Acetosella* (Meisn. apud DC. 63. 1856, pro sectione) Rech. f.

Flores dioici (vel polygami); perigonii florum foeminorum folia interiora fructificationis tempore non dilatata vel nuce ad summum 2-plo maiora, omnino ecallosa. Folia saepe hastata vel sagittata.—*R. Acetosella* L., *R. graminifolius* Lamb.

SUBGEN. II. *Acetosa* (Campd. 1819, p.p.; Meisn. apud DC. 64. 1856, pro sectione) Rech. f.

Flores dioici vel polygami; perigonii florum foeminorum folia interiora fructificationis tempore nuce deinde pluries maiora, ecallosa vel basi callo minuto recurvo praedita. Folia in multis speciebus hastata vel sagittata.—*R. Acetosa* L., *R. thyrsiflorus* Fingerh., *R. paucifolius* Nutt., *R. hastatulus* Baldw.

SUBGEN. III. *Lapathum* (Campd. 1819; Meisn. apud DC. 42. 1856, pro sectione) Rech. f.

Flores omnes vel plurimi androgyni. Perigonii foliola interiora (valvae) fructificationis tempore nuce pluries maiora ecallosa vel callifera. Callus nunquam recurvus. Basis foliorum inferiorum cuneata vel rotundata vel cordata, nunquam hastata vel sagittata.

Sect. A. *Axillares* Rech. f., sect. nov.

Perennes. Caules ex axillis foliorum infra inflorescentiam primariam ramos foliosos serius elongatos et florentes proferentes. Rami inflorescentiae plerumque singuli. Valvae ecallosae vel calliferae in plurimis speciebus integrae. Folia in plurimis plana, basi rotundata vel cuneata.

Subsect. a. *Venosi* Rech. f., subsect. nov.

Monotypica. Descriptio *R. venosi* Pursh.

Subsect. b. *Verticillati* Rech. f., subsect. nov.

Pedicelli fructiferi perigonio maturo pluries longiores, rigidi, prope basin geniculato-articulati.—*R. verticillatus* L., *R. floridanus Meisn.*, *R. fascicularis* Small.

Subsect. c. *Salicifolii* Rech. f., subsect. nov.

Pedicelli fructiferi perigonio maturo non vel ad summum 1.5–2-plo longiores, in medio vel prope basin articulati.—*R. spiralis* Small, *R. altissimus* Wood, *R. ellipticus* Greene, *R. mexicanus* Meisn., *R. Berlandieri* Meisn., *R. triangulivalvis* (Danser) Rech. f., *R. lacustris* Greene, *R. transitorius* Rech. f., *R. pallidus* Bigel., *R. sibiricus* Hultén, *R. utahensis* Rech. f., *R. crassus* Rech. f., *R. salicifolius* Weinm., *R. californicus* Rech. f.

Sect. B. *Simplices* Rech. f., sect. nov.

Annui, biennes vel perennes. Caulis simplex ex axillis foliorum infra inflorescentiam ramos foliosos serius elongatos et floriferos non proferens.[1] Rami inflorescentiae singuli vel fasciculati. Valvae ecallosae vel calliferae, integrae vel vario modo dentatae. Folia plana vel crispata, inferiora basi cuneata vel rotundata vel cordata.

Subsect. a. *Hymenosepali* Rech. f., subsect. nov.

Monotypica. Descriptio *R. hymenosepali* Torr.

Subsect. b. *Densiflori* Rech. f., subsect. nov.

Rhizomate horizontali perennantes.[2] Valvae callosae. Folia inferiora basi cuneata vel rotundata vel cordata, plerumque in medio latissima.—*R. densiflorus* Osterh., *R. pycnanthus* Rech. f., *R. orthoneurus* Rech. f., *R. praecox* Rydb.

Subsect. c. *Aquatici* Rech. f. Repert. Sp. Nov. 31: 232. 1933, in nota.

Radice verticali perennantes. Valvae ecallosae. Folia inferiora basi saepe cordata, in plurimis speciebus infra medium latissima.—*R. occidentalis* Wats., *R. arcticus* Trautv., *R. fenestratus* Greene.

Subsect. d. *Patientiae* Rech. f. Repert. Sp. Nov. 31: 230. 1933.

Perennes. Folia latitudine 2–4-plo longiora, inferiora in medio circiter latissima, basi leviter cordata vel rotundata vel cuneata. Petiolus supra planus. Valvae rotundato-cordatae, amplae, saepius integrae, una plerumque callifera.—*R. Patientia* L.

[1] Exceptions: (1) If the principal stem is damaged; (2) in overnourished individuals; (3) in some hybrids.

[2] Several species could not be examined in regard to this character.

Subsect. e. *Crispi* Rech. f., subsect. nov.

Perennes. Folia latitudine 3–6-plo longiora, crispa, basi cuneata, in medio circiter latissima. Petiolus supra canaliculatus. Valvae rotundato-cordatae, saepius integrae, omnes vel una callifera. Pedicelli perigonio maturo 1.5–2.5-plo longiores.—*R. crispus* L.

Subsect. f. *Conglomerati* Rech. f., subsect. nov.

Perennes. Folia inferiora latitudine usque 3-plo longiora, basi cordata. Rami inflorescentiae singuli, arcuato-divergentes. Florum glomeruli omnes remoti. Pedicelli perigonio maturo usque 1.5-plo longiores. Valvae parvae integrae linguiformes, una vel omnes calliferae.—*R. conglomeratus* Murr., *R. sanguineus* L.

Subsect. g. *Hydrolapatha* Rech. f., subsect. nov.

Perennes. Folia basi cuneata, plana acuta, consistentia rigida subcoriacea, longitudine usque 5-plo longiora, nervis secundariis angulo recto vel subrecto a primario abeuntibus. Pedicelli fructiferi rigiduli, perigonio maturo usque 2.5-plo longiores. Valvae omnes calliferae integrae. Calli fusiformes.—*R. Britannica* L.

Subsect. h. *Obtusifolii* Rech. f., subsect. nov.

Perennes. Folia basalia basi cordata plana longitudine ca. 2-plo longiora. Pedicelli fructiferi perigonio maturo 1–2.5-plo longiores, in vel infra medium articulati. Valvae una vel omnes calliferae saepius dentatae.—*R. obtusifolius* L., *R. pulcher* L.

Subsect. i. *Dentati* Rech. f., subsect. nov.

Annuae (vel biennes?). Folia inferiora basi leviter cordata vel rotundata vel late cuneata, in vel supra medium latissima longitudine usque 2 (–3) -plo longiores. Valvae saepius dentatae saepius omnes calliferae.—*R. dentatus* L., *R. violascens* Rech. f.

Subsect. k. *Maritimi* Rech. f., subsect. nov.

Annuae (vel biennes?). Folia inferiora linearia vel lineari-lanceolata longitudine usque 6-plo longiora plana vel crispata basi leviter cordata vel truncata vel cuneata. Valvae saepissime longe dentatae omnes calliferae.—*R. maritimus* L., *R. fueginus* Phil., *R. persicarioides* L., *R. flexicaulis* Rech. f.

GENERAL DISCUSSION OF SECT. AXILLARES

Among the most important new data regarding the taxonomy of the genus *Rumex* that I obtained while studying the North American species is the genetic connection of the species of *Lapathum* with axillary branching (sect. *Axillares*). Since the section has in North America its principal area of distribution and probably its most

important center of development, this subject may be discussed here in detail.

Species of *Lapathum* which regularly show leafy axillary shoots, generally producing in normal development secondary inflorescences that often predominate in the principal inflorescence, exist in important number (except in North America) only in South America (*R. argentinus* Rech. f., *R. chrysocarpus* Mor., *R. patagonicus* Rech. f., *R. andinus* Rech. f., *R. chiloensis* Rech. f.). Outside the New World such species appear only in separated geographic regions, in Australia (*R. Brownii* Campd.), in the Hawaiian Islands (*R. giganteus* Ait. and *R. albescens* Hildeb.), in eastern Asia (*R. yungningensis* Samuelsson, *R. sibiricus* Hultén), in South Africa (*R. Ecklonianus* Meisn.), in central Africa (*R. afromontanus* T. Fries). In Europe and in the greater part of Asia the section *Axillares* is absent, but in Europe there have been found adventive during the last decades two American species of sect. *Axillares*, subsect. *Salicifolii*.

The habit of the North American *R. venosus*, the South American *R. cuneifolius*, and the New Zealand *R. neglectus*, with widely extended, creeping, rhizome-like stem which emits sooner or later axillary shoots, can no doubt be considered a modification of the axillary type.

The opinion is surely acceptable that all the mentioned species outside America (except *R. sibiricus*, which belongs to subsect. *Salicifolii*) are relics of ancient lines of development. Most of the New World descendants, on the contrary, have partly kept their freshness of life and their power of accommodation. Many of them are in full development and have been able to occupy new land during alterations in distribution of land and water that took place in recent geologic periods, and they are still able to invade and inhabit regions deprived by man of their original vegetation.

The shape of the fruiting perigonium segments exhibits all the possibilities of this genus. The tendency to enlarge the surface is more or less occasionally—even exceedingly—prominent (*R. venosus* Pursh has the largest existing valves). At the same time the nervation is developed very differently, stronger or delicately graduated (*R. venosus*), or in nets of very different shape in the middle and the border of the valves. The midnerve is either not thickened (especially in the species with important development of the surface of the valves) or only little thickened, or it is transformed on one valve or all three to a smaller or larger grain of oblong, globular-ovate, or spindle-like form of the most different nature. Nevertheless the

characteristic shape of the grain and its proportion to the surface of the valve remain in narrow limits for every species.

The *Axillares* show little tendency toward dentation on the margins of the valves; it is developed considerably only in one species, the Australian *R. Brownii*, and in that to an extreme degree. Among the American *Axillares* only *R. californicus* shows small teeth. Some others have now and then weak and irregular notches on the margins of the valves.

The isolated systematic position of the extra-American species as relics of an ancient group or groups, as mentioned above within the *Axillares*, as well as of the South American *R. Lorentzianus* Lindau and the North American *R. venosus*, can be expressed best by making each the representative of a subsection, while the other South American species may be grouped in two subsections (*R. cuneifolius* Campd. and *R. argentinus* in the first; all the other mentioned South American species in the second). Among the North American *Axillares* the species with very long pedicels (*R. verticillatus* L., *R. floridanus* Meisn., *R. fascicularis* Small—Subsect. *Verticillati*) differ clearly from the mass of all the others—Subsect. *Salicifolii*.

Among the *Salicifolii*—which derive their name from the species first described but previously not well interpreted, *R. salicifolius* Weinm.—three species differ from all the others by the size of the valves and by ovate-lanceolate, elegantly cuspidate leaves (*R. spiralis* Small, *R. altissimus* Wood, *R. ellipticus* Greene).

Rumex lacustris Greene, confined to Oregon, occupies a separate position because of its aquatic habit and its papillous-pubescent terrestrial form. *R. salicifolius* Weinm. nec al. and *R. crassus* Rech. f., both confined to California, have fruiting perigonia with one valve almost completely covered by an extraordinarily prominent grain. With the first is associated, as a parallel species without grains, *R. californicus* Rech. f., with shallowly dentate valve margins. The New England and eastern Canadian *R. pallidus* Bigel., which reappears in Alaska, has well developed grains, but of an oblong shape, and they do not cover the whole surface of the valves. This species is closely related to the east Siberian *R. sibiricus* Hultén, the only extra-North American representative of the *Salicifolii*. *R. transitorius* Rech. f., indigenous in the northwestern United States, lies morphologically between the Californian species and *R. pallidus*. *R. mexicanus* Meisn., *R. Berlandieri* Meisn., and *R. triangulivalvis* (Danser) Rech. f. have small grains in proportion to the valves; among these three *R. mexicanus* has the largest valves and nutlets and is in

the strict sense, as I understand it here, in contrast to Fernald in Rhodora 10: 17. 1908, restricted to Mexico. *R. Berlandieri* also inhabits Mexico, besides the southern United States eastward as far as Louisiana. Among other features, it is characterized by rather small and obtuse, undulate leaves, by scrobiculate, nervose valves of compact structure, and by remote whorls. Because *R. Berlandieri* was misinterpreted by American authors, especially Trelease, who evidently had not seen Meisner's type, the same species has been described a second time as *R. Langloisii* Small. I designate as *R. triangulivalvis* the form resembling and closely related to *R. mexicanus* Meisn. but constantly differing by smaller valves and nutlets, which was identified by Fernald (loc. cit.) with *R. mexicanus*. Its home is southeastern Canada and the northeastern and middle United States. It is apparently the only species of this group that has been introduced into Europe. It appears in a scarcely differing form in the mountainous western states: var. *oreolapathum* Rech. f. This mountain race of *R. triangulivalvis* finds a parallel species without grains in *R. utahensis*.

Thus the numerous species of *Salicifolii* cover the whole North American continent except the arctic and subarctic regions and the southeast (Florida and adjacent states), and extends northwest to Asia.

Herewith there is given for the first time an essay of a demarcation and general characterization of this peculiar group. There is no doubt that the group *Salicifolii* is a natural one; but how far I have succeeded in the taxonomic arrangement of species—without the field study and cytological investigations essential for such critical groups—will become apparent later. The group *Salicifolii* does not show any geographic arrangement in the sense that it is represented in each region by only one species. In the south as well as in the west, several well-differentiated types grow close together. This fact could be interpreted as pointing to a great independence of these types. If in most cases I have chosen binary names for the representatives of the *Salicifolii* it has been not only for that reason, but also for practical considerations. In treating polymorphous groups I have the conviction that the supposed, mostly plastic or versatile parental connection of the various members is better expressed in a discussion rather than invested with precipitate, so to speak, assumptions that necessarily become on paper complicated clumsy formulae of dogmatic character. Yet it can not be denied that when taxonomic changes become necessary with the progress of knowledge, binary names are easier to handle than more complex ones.

Schematic essays of classification, especially when based exclusively on cultivated material and without any attempt to consider the results of research based on study of wild forms, as those of Danser, Nederl. Kruidk. Arch. 415. 1925, can only be considered as an expedient for the very first phases of systematic inquiry and should never be stated in a taxonomic way.

To friends of the broader limitation of species and of the clumsier nomenclatorial apparatus bound to it I wish to indicate, nevertheless, how some of the species accepted by me could, conceivably, with greater knowledge of them than is available at present, be united to form collective species, and also which species will resist, in my opinion, any condensation, under all circumstances.

R. spiralis will remain separated. *R. altissimus* and *R. ellipticus* may well be united. *R. lacustris* will probably remain a separate entity but it may be that it could be connected with *R. hesperius*, with western forms only incompletely understood by me of which I have had only incomplete or inadequate material. I should not be astonished if *R. crassus* were a diploid or multiploid race of *R. salicifolius*. These two species, and perhaps also *R. californicus* as a grainless parallel race of the latter with denticulate valves, could eventually be united. *R. pallidus* and *R. sibiricus* should be united. It remains doubtful whether *R. transitorius* has to be joined with *R. salicifolius-crassus*, *R. sibiricus-pallidus*, or with *R. mexicanus-triangulivalvis* because of its intermediate position. *R. Berlandieri* will better remain separated. *R. mexicanus* and *R. triangulivalvis*, including var. *oreolapathum*, may be united with *R. utahensis* as a grainless mountain form. On the other hand, *R. utahensis* resembles in some of its forms *R. californicus;* both are grainless and both seem to meet in the Californian mountains and then are not to be distinguished with certainty. As indicated, they seem to be of different origin.

The history of the *Salicifolii* is short. *R. salicifolius* was the first group to be described, and its name was used during a long time for all or at least almost all the species of this group. It was used also by Trelease in this wide sense. Meisner, when establishing *R. mexicanus* and *R. Berlandieri*, seemed not to have a clear conception of their parental position. The name *R. mexicanus* came to connote a special entity by Fernald, as he used it for a form widely spread over the middle, northern, and eastern United States. This form is really closely related to *R. mexicanus* Meisn., but differs by slight, although constant characters in the size of the

valves and nutlets. The name *R. Berlandieri*, on the contrary, has never been used in the correct sense since Meisner's treatment, especially owing to Trelease's misinterpretation of it. Under this name generally has appeared a species of a quite different group (*R. violascens* Rech. f.); in a widely circulated exsiccatum (Pringle), also *R. conglomeratus*. Again the plant named by Meisner was described a second time as *R. Langloisii* Small, but the latter author made a valuable discovery with *R. spiralis*. I have not seen any type specimen of *R. altissimus* Wood, consequently I have used the name as Trelease and most American authors do, although I am not quite convinced that this conception is right.

Danser's classification of the *Salicifolius* group (see above) is based purely on the study of cultivated and introduced plants. He distinguishes two subspecies, ssp. *triangulivalvis* and ssp. *angustivalvis*, and three varieties, var. *trigranis*, var. *unigranis*, and var. *nudivalvis*. Subsp. *triangulivalvis* var. *trigranis* corresponds to the most widespread type and is treated in the present paper as a species. Subsp. *angustivalvis* var. *unigranis* corresponds to *R. salicifolius* Weinm., nec aliorum. Danser's observations on the development of *R. salicifolius* (op. cit. 423) are of special interest and of great influence on the natural arrangement of the genus, viz., (1) *R. salicifolius* does not develop radical leaves; (2) though perennial, it is able to flower in the first year if circumstances are not too unfavorable; (3) it does not go through a resting period after maturity of the principal fruiting panicle, but develops axillary branches below the principal panicle during its ripening. When the second one is ripening, the fruits of the first are falling off, and so on until the frost comes.

KEY TO SPECIES

Flowers dioecious or polygamous; leaves hastately lobed (except species 5 and sometimes 6). Subgenera *Acetosa* and *Acetosella*.

Valves rarely enlarged, as large or at most twice as large as the nutlet. Subgenus *Acetosella*.

Leaves short, oblanceolate, hastate, with usually large basal lobes; panicle amply branched; valves very small, not larger than the nutlets, without grain and without distinct nervation..... 1. *R. Acetosella*.

Leaves narrow, linear, without or with small basal lobes; panicle sparse; valves of nearly double the size of the nutlet. 2. *R. graminifolius*.

Valves enlarged, distinctly overtopping the nutlet. Subgenus *Acetosa*.

Leaves narrowed at the base, never with hastate lobes. 5. *R. paucifolius*.

Leaves with hastate lobes.

Stems robust; leaves usually cordate-oblong; valves about 5 mm. wide (see also 4. *R. thyrsiflorus*)...3. *R. Acetosa*.

Stems slender; leaves narrow, usually variable in shape; valves about 4 mm. wide.....6. *R. hastatulus*.

Flowers usually androgynous; leaves never hastately lobed. Subgenus *Lapathum*.

Stems erect, ascending, or procumbent, with axillary shoots. Sect. *Axillares*.

Valves wider than 20 mm., grainless, with a fine, double reticulation; ocreae wide, conspicuous.....7. *R. venosus*.

Valves much smaller, at most 15 mm. long; ocreae smaller, appressed. Subsect. *Salicifolii*.

Pedicels (2–) 2.5–5 times longer than the fruit.

Stems slender, low; leaves broad and short, at most twice as long as broad, often still shorter, the nerves forming an angle of about 80° with the midnerve. 10. *R. fascicularis*.

Stems tall, robust; leaves at least 3 times longer than broad, the nerves forming an angle of about 45° with the midnerve.

Panicle open; pedicels conspicuous, 3–5 times longer than the fruits, these yellowish; valves rarely as broad as long, or narrower; leaves 5–7 times as long as broad.....8. *R. verticillatus*.

Panicle rather dense; pedicels relatively inconspicuous, (2–) 2.5–3 times longer than the fruit; ripe fruits dark; valves often broader than long; leaves 3–5 times as long as broad.....9. *R. floridanus*.

Pedicels at most twice as long as the fruit.

Valves 7–8 mm. long, 8–12 mm. broad.....11. *R. spiralis*.

Valves much smaller.

Leaves ovate-lanceolate, broadest below the middle; valves more than 4.5 mm. long. 12. *R. altissimus* and 13. *R. ellipticus*.

Leaves usually narrower, lanceolate or linear-lanceolate, but if exceptionally broad, the fruits much smaller.

Valves grainless.

Stems slender but rigid, relatively tall, abundantly branched; leaves narrow; fruiting panicle large, open; valves rather distinctly denticulate. 24. *R. californicus.*

Stems thickish, mostly low, little branched; leaves broader; fruiting panicle small, very compact; valves a little crenulate at the base, nearly entire.....21. *R. utahensis.*

One valve or all grain-bearing.

Grains occupying nearly the whole breadth of the valve (the margin of the valve is on both sides of the grain narrower than the grain).

Valves relatively large, 4–5 mm. long; leaves 2–3 times longer than broad.....22. *R. crassus.*

Valves much smaller; leaves narrower.

Valves very small, 2.3–3 mm. long, only one with a grain.....23. *R. salicifolius.*

Valves larger, all with grains.

Valves 3–4 mm. long, scarcely longer than the grains, yellowish; nutlets about 2.5 mm. long. 19. *R. pallidus* and 18. *R. transitorius.*

Valves 2.5–3 mm. long, distinctly longer than the grains, brownish; nutlets scarcely 2 mm. long.....20. *R. sibiricus.*

Grains much narrower than the breadth of the valves (the margin of the valve is on both sides of the grain at least as broad as the grain. Compare also 25. *R. cuneifolius*).

Valves very small, 2.1–2.5 mm. long, with small grains; plants occurring in a broad-leaved, subglabrous, submersed state and in a narrower-leaved, papillate, emersed state. 17. *R. lacustris.*

Valves usually more than 3 mm. long; plant never living submerged; leaves longer and narrower, never papillate.

Leaves small and thickish, in the dry state olive-green, often undulate, somewhat obtuse, with strongly prominent nerves beneath; panicles interrupted; most whorls remote. 14. *R. Berlandieri.*

Leaves larger, rather thin, in the dry state pale green, acute; nerves scarcely prominent; fruiting panicle not interrupted, or only in the lower part.

Valves about 4 mm. long; nutlets about 2.5 mm. long.....15. *R. mexicanus.*

Valves about 3 mm. long; nutlets about 2 mm. long.....16. *R. triangulivalvis.*

Stems usually erect, without axillary shoots.

Valves grainless, at most one of them with a diminutive, globular suggestion of a grain (*R. domesticus*), entire or finely and indistinctly erose-crenulate, rarely finely denticulate (*R. pycnanthus*).

Valves more than 10–16 mm. long; leaves gradually narrowed; ocreae large, persistent.....26. *R. hymenosepalus.*

Valves much smaller; ocreae delicate, caducous.

Plants with a vertical root.

Valves broad, rounded, nearly reniform, often broader than long, one sometimes with a diminutive, globular grain; leaves broadest at the middle, at the base abruptly narrowed, occasionally subcordate, the margin mostly undulate.....32. *R. domesticus.*

Valves roundish-ovate or cordate, often a little longer than broad, never with a suggestion of a grain.

Stems low; panicle not branched or with few short branches; leaves thickish, mostly narrowed on both sides; valve nerves thickish but indistinct; whole plant often with a purple tinge. 34. *R. arcticus.*

Stems tall; fruiting panicle usually compound; leaves mostly cordate at the base, but their shape most variable; valve nerves fine and distinct.

Valves more than 7 mm. long....35. *R. fenestratus.*

Valves to 5 mm. long.....33. *R. occidentalis.*

Plants with a creeping rootstock (compare also 31. *R. alpinus*).

Plants low; all leaves blunt, never more than twice as long as broad.....30. *R. praecox.*

Plants tall; only the earliest leaves, if any, short and blunt, all the others about 3 times longer than broad, pointed.

Lateral leaf nerves forming a right angle with the midnerve; valves small, about 4 mm. long.
29. *R. orthoneurus.*

Lateral leaf nerves forming an acute angle with the midnerve; valves larger, 5–6 mm. long.

Valves nearly twice as long as broad, narrow, triangular, very pointed, rather distinctly denticulate near the base.....28. *R. pycnanthus.*

Valves as long as or only a little longer than broad, scutiform, indistinctly crenulate-denticulate to entire.....27. *R. densiflorus.*

At least one valve with a distinct grain.

Valves entire.

Leaves broad, flat, the nerves forming almost a right angle with the midrib; grain oblong, much longer than broad.
40. *R. Britannica.*

Leaves narrower, the nerves forming an acute angle with the midrib; grain ovate-oblong, at most 1.5 times longer than broad.

Leaves small, flat, and truncate; valves very small, scarcely broader than the thick grains; whorls remote, nearly all with leaves (compare also 39. *R. sanguineus*).....38. *R. conglomeratus.*

Leaves large, somewhat crisped or undulate, often narrowed at the base, seldom truncate; valves large, much broader than the grains; only the lower whorls with leaves and occasionally remote.

Leaves rather narrow, broadest at the middle, mostly much undulate, gradually narrowed to the base; petiole somewhat canaliculate on the upper side; valves (3.5–) 5–6 mm. long (shape of the leaves, the valves, and the number of the grains most variable).....37. *R. crispus.*

Leaves broader, often broadest below the middle, suddenly narrowed toward the base, truncate or slightly cordate, less undulate; petiole flat on the upper side; valves larger; grains smaller in proportion to the valves (rare).....36. *R. Patientia.*

Valves denticulate (compare also 49. *R. bucephalophorus*).

Plants perennial; basal leaves at most 2.5 times longer than broad, cordate at the base.

Leaves small; pedicels long, slender, nearly twice as long as the fruit, articulate at the middle. 42. *R. pulcher.*

Leaves large; pedicels long, slender, nearly twice as long as the fruit, articulate toward the base.
41. *R. obtusifolius* (mostly subsp. *agrestis*).

Plants mostly annual (but sometimes tall and robust); basal leaves 3–6 times longer than broad.

Pedicels thickish; valves shortly dentate; leaves obcordate-lanceolate, mostly widest above the middle, nearly 3 times longer than broad..44. *R. violascens.*

Pedicels long, slender; valves mostly long-dentate; leaves linear-lanceolate, mostly many times longer than broad.

Valves 3–3.5 mm. long, broad, triangular, relatively short-dentate; grain much narrower than the valve; leaves broad.....45. *R. flexicaulis.*

Valves at most 2 mm. long, narrow, triangular or elliptic, little broader than the grain, the teeth generally long, fine, often nearly hair-like (compare also 48. *R. maritimus*).

Valves triangular; grain fusiform, narrowed (length of the teeth very variable)....46. *R. fueginus.*

Valves ovate; grain thickish, rounded.
47. *R. persicarioides.*

1. Rumex Acetosella L.

A low, slender perennial with linear or lanceolate, hastate leaves; valves entire, not enlarged in fruit, not larger than the nutlet, grainless.

SYNONYMY: L. Sp. Pl. 338. 1753; Michx. 216. 1803; Pursh 249. 1816; Campdera 122. 1819; Hook. 129. 1840; Meisn. apud DC. 63. 1856; Watson 10. 1880; Macoun 418. 1883; Trelease 46. 1892; Britt.

& Brown 547. 1896; Small 369. 1903; Piper 225. 1906; Gray 357. 1908; Woot. & Standl. 191. 1915; Rydb. R. 230. 1922; Jepson 293. 1923; Tidestrom 160. 1925; Rydb. P. 279. 1932; Rech. f. Vorarb. 3: 47. 1933.

A weed of European and Asiatic origin, naturalized nearly throughout the world. The subsp. *angiocarpus* Murb., Beitr. Fl. Südbosn. 46. 1891, is remarkable in the union of the valves and nutlets into a single body. American specimens cited below as only *R. Acetosella* are mostly staminate or pistillate and in flower, consequently I was unable to decide whether they are the common *R. Acetosella* or subsp. *angiocarpus* Murb.

ALASKA: Opening near edge of lake, Fortman Hatchery, Revillagigedo Isl. (*Walker* 1031, NY, P, Ca; basal leaves only). Sitka and vicinity, abundant about town (*Wright* 1557, Ca). Sitka (*Shaw*, P).

BRITISH COLUMBIA: New Westminster (?, Ca). Victoria (*Anderson*, P).

ONTARIO: Battersea, Kingston (*Fowler*, Ca).

QUEBEC: Côte-Nord du golfe St. Laurent, Natashquan, dunes (*Marie-Victorin & Rolland-Germain* 28554, St; *angiocarpus*). Cushing (*Adrien* 1288, St). Mont Oxford, sur un rocher dénudé (*Rousseau* 25263, St).

MAINE: Birch Island, Attean Pond, Jackman, Somerset Co. (*Schweinfurth* 574, P; *angiocarpus*).

MASSACHUSETTS: Amherst (*Brooks*, Ca). Hanson, field (*Morris*, Ca).

CONNECTICUT: Norwich (*Setchell*, Ca; *angiocarpus*). Berlin (*Brandegee*, Ca).

MINNESOTA: Zumbrota, Goodland (*Ballard*, Ca, P; subsp. *eu-Acetosella*). Itaska Park, headwaters of Mississippi River, along road, and in sand, Clearwater Co. (*J. B. Mayer*[?] 17, Ca).

WISCONSIN: Iowa Co., Blue Mounds (*Clikeman*, Ca). Brodhead, Green Co. (*W. C. Meyer* 5666, P).

ILLINOIS: Morgan Park Ridge (*Dixon & Gage* 656, Ca). Muncie, roadsides (*Gleason*).

IOWA: Grinnell, Poweshiek Co. (*Suksdorf*, P).

INDIANA: Indianapolis, Gladstone Avenue (*Friesner* 8731, P).

MISSOURI: St. Louis, Forest Park (*Eggert*, Ca; *angiocarpus*). Oakwood, Ralls Co. (*Davis* 4449, Ca).

ARKANSAS: Without locality (*Rafinesque*, DC).

SOUTH DAKOTA: Black Hills, Whitewood, 1,350 meters (*Rydberg*, Ca). Creek bottom, Deadwood (*Carr* 2113, Ca; *angiocarpus*). Brookings (*Thornber*, Ca).

WASHINGTON: Chehalis, Hoquiam (*Lamb* 1018, Ca). Camano Isl., abundant everywhere (*Gardner*, Ca). Friday Harbor, San Juan Co. (*St. John & Redout*, 3635, P; *angiocarpus*). Buffalo Rock, Snake River Canyon, Asotin Co. (*St. John, etc.* 8253, P; *angiocarpus*). Pullman (*Piper*, P; *angiocarpus*). Wenaha Forest, Columbia Co. (*Darlington*, P). Tucanon Valley, Columbia Co. (*Darlington*, P; *angiocarpus*). Kalama (*Goodwin* 31, P). Clark's Spring, Spokane, Spokane Co. (*Kreager* 129, P; *Beattie & Chapman* 2035, P). Stuart Island, San Juan Co. (*Lawrence* 53, 382, P). Centralia, Lewis Co. (*Owen*, P). Mazama Ridge, Mt. Rainier, Lewis Co. (*Hungate* 2, P). Mt. Adams (*Flett* 1046, P). Eight-mile Creek, Methow River Valley, Okanogan Co. (*Hungate* 18, P). Palouse River, Colfax, Whitman Co. (*Parker* 388, P). Anatone, Asotin Co. (*Gussell*, P). Seaview, Pacific Co. (*Spiegelberg* 638, P). Mt. Erie, Hidalgo Isl., Island Co. (*Hardin*, P). Camp Lewis, Pierce Co. (*Davidson*, P).

OREGON: Umpqua Valley, Roseburg Quadrangle, Douglas Co. (*Cusick*, P; *angiocarpus*). Sauvies Isl. (*Howell*, P). Albina, Portland (*Suksdorf* 716, P; *multifidus*). Portland (*Millard*, P). Mt. Hood, Hood River Co. (*English, Jr.*, 238, P). Grand Ronde Valley, near Union, Union Co. (*Cusick* 3340a, P). North Bend, Coos Co. (*H. H. Smith* 3703, NY). Fossil Lake, between Lakeview and Bryants (*Furlong, Greeley, etc.*, Ca).

IDAHO: Moscow, Latah Co. (*Abrams* 614, Ca). Lewiston, Nez Perce Co., 450–600 meters (*Heller* 3016, Ca). About forest, Nez Perce Co., 1,050 meters (*H. E. Brown* 22, Ca). Boise, sunny inclines, 865 meters (*Clark* 49, Ca, St). Boise, Ada Co., 840 meters (*Macbride* 248, P, Ca). Bear Creek Ranger Station, Idaho Co. (*K. F. Baker*, P; *angiocarpus*).

NEVADA: Kings Canyon, Ormsby Co., 1,700–2,000 meters (*Baker* 1202, P, Ca; *angiocarpus*). Truckee Meadows, Washoe Co., 1,350 meters (*Kennedy* 3053, St; *angiocarpus*).

NEW MEXICO: Hunter's Lodge near junction of Willow and Gilita creeks, Mogollon Mts., 2,550 meters, base of south slope (*Goddard* 735, Ca).

ARIZONA: Rincon Mts., Manning Camp, 2,370 meters (*Blumer* 3380, Ca).

CALIFORNIA: Scott River Valley (*Gilbert*, Ca). Near Laytonville, Mendocino Co. (*Davy* 5266, Ca). Near Comptche, Mendocino Co.

(*Walker* 289, Ca; *angiocarpus*). Near Mendocino, from sea level to 1,500 meters (*Brown* 717, Ca). Mt. Lassen, near Morgan, Tehama Co., Mill Creek Canyon, 1,500 meters (*Babcock & Hall* 4384, Ca). Lakeport, Lake Co. (*Holman*, Ca). Siskiyou Co., vacant lot, Greco (*Butler* 515, Ca; *angiocarpus*). Near Sisson, Siskiyou Co. (*Brown*, Ca). Horse Prairie, south side of Humboldt Redwood Park (*L. Constance* 807, P). Humboldt Co., vicinity of Eureka, 0–150 meters (*Tracy* 2414, Ca). North Coast Range, near Camp Grant, Humboldt Co. (*Davy* 5484b, Ca). Tuolumne Co., in sand, mouth of Bear Creek, Stanislaus River, 190 meters (*Williamson* 293, Ca). Yosemite Valley (*Fritchey* 58, SL). Sierra Nevada, pine ridge, Fresno Co., 1,590 meters (*Hall & Chandler* 275, Ca). Santa Cruz (*Berg*, Ca). North of Sacramento (*Ramaley* 11193, Ca). Vicinity of Oakland (*Holder* 2528, Ca). Berkeley (*Davy*, Ca). North Berkeley (*Condit*, Ca; var. *multifidus* DC.). Alameda Co., Berkeley Hills (*Parks* 1870, Ca). Amador Co., vicinity of Ione, 60–150 meters (*Braunton* 1008, Ca). Placer Co. (*Carpenter*, Ca). Arroyo Grande (*Condit*, Ca). Keen Camp, San Jacinto Mts., 1,440 meters (*Johnston* 5432, Ca). Los Angeles (*pupils of L. A. High School*, Ca). San Francisco Peninsula, Lake Merced (*Jones*, Ca; *angiocarpus*). Gravelly portion of meadow, Bluff Lake, San Bernardino Mts., 2,220 meters (*Munz* 10436, Ca). Alamere Creek, Marin Co., 8 miles above Bolinas (*Randall*, Ca; *angiocarpus*). Aromas (*C. Meyer* 357, Ca; *angiocarpus*). Cascade Drive, Mill Valley (*Walker* 644, Ca; *angiocarpus*).

JAMAICA: Blue Mt. Peak (*Orcutt* 5534, Ca; *angiocarpus*, partly).

2. **Rumex graminifolius** L.

Perennis. Caulis singulus vel saepius plures, erecti, tenues, stricti vel subflexuosi, paucifoliati, internodiis mediis ± elongatis, tenuissime sulcato-striati, ca. 6–25 cm. alti. Ochreae majusculae hyalinae candidae vel argenteo-nitentes, magnae, ± patentes, fissae sed persistentes. Folia basalia angustissime linearia, lamina petiolo saepe vix latiore, 3–5 mm. lata interdum revoluta, 3–6 cm. longa, basi utrinque lobo angustissimo acuto angulo fere recto patente provisa vel lobis omnino deficientibus. Folia caulina pauca basalibus similia interdum non evoluta. Panicula parva saepe pauciflora laxiuscula. Pedicelli floriferi flore breviores, fructiferi fructum aequantes, paulo infra perigonium insensibiliter articulati. Perigonii foliola exteriora marginibus interiorum appressa. Perigonii folia interiora (valvae) nuce ad summum duplo longiora et latiora. Nux 1.2–1.5 mm. longa, 1 mm. lata, rufo-brunneo-nitens, in medio circiter latissima.

SYNONYMY: *R. graminifolius* Rud. in Georgi, Beschreib. Russ. Reich 3, pt. 4: 921. 1800, nomen; Lamb. Trans. Linn. Soc. 10: 264. 1811; Meisn. apud DC. 64. 1856; Murbeck, Bot. Not. 42. 1899. *R. angustissimus* Ledeb. Mém. Acad. St. Pétersb. 5: 531. 1815.

ILLUSTRATION: Trans. Linn. Soc. 10: *pl. 10.*

DISTRIBUTION: Arctic Europe, Siberia, and America.

Only one American specimen examined: Alaska, Port Clarence, 65° 5′ N., 166° W. (*Kjellman*, St).

As the American specimen is very poor and not fruiting, I completed my description from Murbeck's, loc. cit., and from a Siberian specimen: Prov. Tobolsk, Obskaja Gub. Mys Kamenyi, 68° 30′ (*Saposchnikov & Nikitina*, MW). *R. graminifolius* is similar to certain forms of *R. Acetosella* (f. *integrifolius* Wallr. Sched. Crit. 1822; 186), especially as they occur in arctic regions, e. g., in Greenland (Hb. Stockholm). From these forms *R. graminifolius* is distinguishable by the valves, which are nearly twice as long as the nutlets.

3. **Rumex Acetosa** L.

Perennial; stems simple below the panicle; lower leaves ovate or oblong-ovate, 2–4 times longer than broad, deeply cordate at the base, with acute, hastiform or nearly sagittate auricles, somewhat obtuse at the apex; panicle usually small and rather compact, leafless; pedicels about as long as the fruiting perianth, jointed at the middle; outer perianth segments reflexed; valves orbicular, 3.5–5 mm. in diameter, with a small grain near the base.

SYNONYMY: L. Sp. Pl. 337. 1753; Hook. 129. 1840; Meisn. apud DC. 65. 1856; Macoun 417. 1883; Trelease 78. 1892; Britt. & Brown 548. 1896; Gray 357. 1908; Rydb. R. 231. 1922; Rydb. P. 279. 1932.

Widely spread over Europe and Asia and (according to Trelease, op. cit. 79) indigenous in America from "Labrador to Lake Superior, Alaska, and Oregon," and "introduced from the Old World at a few points in the Northern States, probably as a waif from gardens in which it is sometimes cultivated for its acid foliage." I saw specimens only from the following localities:

NEWFOUNDLAND: Torbay (*Howe* 1362, Ch).

ALBERTA: Milk River Bridge, in rich meadows (*Macoun* 12908, O). Headwaters of Saskatchewan and Athabasca rivers, Brogeon opposite Cotawet Pass (*S. Brown* 1046, O).

BRITISH COLUMBIA: Lake Louise (*Anderson*, P). Oak Bay (*Anderson*, P).

ALASKA: Little Diomede Isl., Behring Strait (*Weyer, Stall–McCracken Exped.*, NY).

OREGON: (*E. Hall* 442, SL). Silverton, Marion Co. (*Howell*, P).

4. **Rumex thyrsiflorus** Fingerhut

Nearly related to *R. Acetosa*, but differing from that species by the often taller stem, 50–120 cm. high, the leaves 4–12 times as long as broad, the panicle with many short branches and very dense; valves smaller, 2.5–3.3 mm. long. Flowering (in Europe where it is found sometimes in the same places as *R. Acetosa*) usually two weeks later than the latter. Originally from Europe and Asia; only one American specimen seen.

SYNONYMY: Linnaea 4: 380. 1829. *R. Acetosa* L. var. *auriculatus* Wallr. Sched. Crit. 182. 1822.

HAITI: Massif de la Selle, Marigot, Jardins Bois-Pin, near Source-Cresson, roadside, 2,100 meters (*Ekman* 10053, Wa).

To be expected on the American continent.

5. **Rumex paucifolius** Nutt. apud Wats. Figure 1

Radix perennis crassa atra fusiformis, saepe collo residuis caulium et petiolorum dilaceratis ± comosa, valde elongata, multiceps, caules floriferos et rosulas foliorum complures interdum permultos proferens. Caules floriferi stricte erecti (12–) 30 (–60) cm. alti, validi crassiusculi interdum subfistulosi, pallide virides, tenuiter canaliculato-sulcati, internodiis infra inflorescentiam paucis subelongatis. Ochreae albidae vel candidae hyalinae amplae fere infundibuliformes diu persistentes. Folia omnia plana, glabra et laevia, consistentia in vivo ut videtur subcarnosa, in sicco crassiuscule membranacea, colore pallide viridia, nunquam hastata vel auriculata. Folia basalia late lanceolata vel ovato-lanceolata, (3–) 6 (–9) cm. longa, (0.6–) 1.5 (–3) cm. lata, basi apiceque subaequaliter angustata, in medio—rarius basin versus—latissima. Nervus medianus crassus, nervi secundarii tenues, angulo ca. 30°–50° a mediano abeuntes. Petioli foliorum basalium crassiusculi, in vivo certe carnosi, laminae longitudinem subaequantes. Folia caulina pauca sursum valde decrescentia, anguste lanceolata, breviter petiolata, acutiuscula vel obtusiuscula. Inflorescentia rufescens, ± anguste paniculata, saepe contracta rarius laxa, subaphylla, interdum ramis inferioribus elongatis crebre subdivaricato-ramosis subcorymbosa, rami flexuosi erecto-patentes, infimi saepe fasciculati et ramosi, superiores singuli et simplices, infimi saepe elongati.

Florum glomeruli aphylli 3–12-flori saepius approximati vel contigui, rarius ± remoti. Pedicelli tenuiter filiformes breves, ± 2 mm. longi, infra medium insensibiliter articulati, perigonio fructifero plerumque breviores. Flores masculi ca. 1.5 mm. longi virescentes vel purpurascentes, antherae aureae, ca. 1.2 mm. longae. Flores feminei purpurascentes, stigmata flava penicillata. Perigonii foliola exteriora anguste lanceolata, ca. 0.8 mm. longa, basibus interiorum appressa. Perigonii folia interiora (valvae) in statu fructifero 2.9–3.8 mm. longa et lata, colore pallide carneo-bruneo, consistentia tenuiter membranacea, margine integra, basi ± anguste et profunde emarginata, apice rotundata, facie tenuissime elevate reticulato-nervosa, nervus medianus ceteris subvalidior plerumque non callifer. Nux matura brunea nitida, 1.2–1.8 mm. longa, 0.8–1 mm. lata, infra medium latissima.

SYNONYMY: *R. paucifolius* Nutt. apud Wats. Bot. King 314. 1871; Watson 10. 1880; Coulter 318. 1895; Macoun 417. 1883; Piper 225. 1906; Rydb. R. 231. 1922; Jepson 293. 1923; Tidestrom 160. 1925. *R. Engelmannii* Meisn. β *Geyeri* Meisn. apud DC. 64. 1856. *R. Geyeri* Trelease 78. 1892.

ILLUSTRATION: Trelease 1892, *pl. 15* (*R. Geyeri*).

DISTRIBUTION: Rocky Mountains from Canada to California.

ALBERTA: Vicinity of Banff, valley below Mt. Aylmer, 2,200 meters (*McCalla* 2397, Wa). Wet, grassy places, eastern summit of North Kootanie Pass, Rocky Mts. (*Dawson* 23703, O). Headwaters of the Saskatchewan and Athabasca rivers, upper Malique(?) Valley (*S. Brown* 1329, O; 1528, NY).

MONTANA: Flathead Divide, Gallatin Co. (*Jones*, Ca). Spanish Creek (*Vogel*, Wa). Yellowstone Park, Bridger Mts., 2,100 meters (*Rydberg & Bessey* 5346, Wa). Spanish Basin, Madison Range, 1,800 meters (*Flodman* 402, Wa). Gallatin Co., Spanish Basin, 1,950 meters (*Rydberg & Bessey* 5348, Wa). Midvale (*Umbach* 358, Wa). Northeast of Bozeman, Gallatin Co. (*Chestnut & Jones* 195, NY). Bozeman (*Blankinship* 455, Ch). Elkhorn Mt., 2,400 meters (*Brandegee*, Ca). Missoula, 960 meters (*Kirkwood* 1761, La, Ch). Rockwall Basin, Wilsall, Park Co. (*Suksdorf* 435, P, MW).

WYOMING: Teton Pass (*Merrill* 355, Wa). Low ground, Seckie(?) (*Merrill & Wilcox* 543, Wa). Dry soil, Teton Pass (*Merrill & Wilcox* 984, Wa). High, dry places, Wind River Mts. (*Forwood*, Wa). Parks, Big Horn Mts., Sheridan Co. (*Forwood*, Wa). Sheridan Co., Rapid Creek Park, 2,250 meters (*Pammel & Stanton*, SL). Subalpine meadow, Wyoming Range, 15 miles west of Merna, Sublette Co.

FIG. 1. *Rumex paucifolius* Nutt.

(*Payson* 2769, Ch, Ca). Above Petrified Tree, 1,950 meters, Camp Roosevelt (*Conard* 1121, MW). Yellowstone Park, near Mammoth Hot Springs (*Burglehaus*, St, Wa). Glen Creek, wet meadows, Yellowstone Park (*A. Nelson* 5582, La, Wa, NY). Electric Peak, 2,550 meters (*E. C. S.* 135, Wa). Yellowstone Park (*Knowlton*, Wa; *Mearns* 1405, 1044, Wa). Minor Lake Plateau, 2,670 meters, Yellowstone Park (*Tweedy*). Big Horn Mts., headwaters of Clear Creek and Crazy Woman River (*Tweedy* 3271, La). Ten Sleep Lakes, Big Horn Co. (*Goodding* 458, La). Lepee Creek (*Willits* 281, La). Jenny Lake (*Eikenberry* 39, Ch). Moran, Jackson Lake, Teton Mts. (*Yuncker* 5354, Ch).

COLORADO: Steamboat Springs, Routt Co. (*Eastwood*, Ca; *Osterhout* 2779, Wa, La). Subalpine semi-meadows, Rabbit Ear, Larimer Co. (*Goodding* 1546, NY, Ca, Be).

WASHINGTON: Without locality (*Canby* 1068, Ca; *Vasey* 121, Wa; 291, P). Falcon Valley, loose, volcanic soil (*Suksdorf*, Ca). Wenatchee Mts., Kittitas Co., in small, grassy plots near streams at the summit, 1,800 meters (*Elmer* 448, P, Wa; *Cotton* 1129, P).

OREGON: Elk Mts., Wallowa Co., 1,500 meters (*Sheldon* 8461, Wa, SL). Steins Mts., opposite Andrews, 1,950 meters (*Leiberg* 2559, NY, St, Wa, Ca). Big Meadows, Des Chutes River, Crook Co., 1,350 meters (*Leiberg* 501, Wa, Ke). Wet meadow, Summit Prairie, southern Blue Mts. (*Cusick* 2651, Ca, Ke, MW). Klamath Agency (*Walpole* 226, Wa). Eppa Glade, Swan Lake Valley, Klamath Co. (*Applegate* 3571, Ch). Rock Creek Bridge, Klamath Falls, Pelican Bay Road (*Peck* 2500, P).

IDAHO: Corral, Camas Prairie, Blaine Co., meadows near river (*Macbride & Payson* 2916, Ca, NY). Moist stream flat, 1,650 meters, Twilight Gulch, Owyhee Co. (*Macbride* 981, P, Ca). About Forest, Nez Perce Co., 1,050 meters (*Heller* 3437, Wa, Ca, Le, Z). Wet meadows, Nez Perce, highlands, rare (*Geyer* 488, MW, Ke; 484, D; type number of *R. Engelmannii* var. *Geyeri* Meisn.). In meadows, House Creek, Owyhee Co. (*Macbride & Nelson* 1840, NY, St). Near reservoir, Modoc Creek, Fremont Co., Targhee Forest, 2,400 meters (*Eggleston & Bowers* 22028, Wa). Caribou Forest (*Favre* 138a, La). Near Sawtooth (*Evermann* 600, Wa). Sawtooth Mts., 2,400–2,700 meters (*Boone*, La). Craig Mts. (*Henderson* 2404, P).

NEVADA: Upper Corral Creek, Jarbidge, wet slopes, 2,100 meters (*Macbride & Nelson* 2052, St, Wa).

CALIFORNIA: Willow Creek, Devils Garden (*Austin* 428, Wa, Ca). Low, flat, wet soil, Big Valley, Lassen Co. (*Nutting*, Ca). Modoc

Co., White Horse Lake (*Baker & Nutting*, Ca). Kaweah River Basin (*Hopping* 58, Ca). Sierra Valley (*Lemmon*, NW). Sierra Nevada, Mt. Silliman, 3,200 meters (*Palmer* 2094, Wa). Sierra Nevada, basin of the Upper Kern River, Tulare Co., Volcano Creek, 2,250 meters (*Hall & Babcock* 5456, Ca). Sierra Nevada, Mt. Goddard, 3,060 meters (*Hall & Chandler* 661, Ca). Inyo Co., Rock Creek Lake Basin, 3,240 meters, top of escarpment near Heart Lake, in *Pinus albicaulis* woods (*Peirson*, Ca). Soda Springs, Tuolumne Valley (*Brewer* 1696, Ca, Wa, P). Yosemite Valley (*Lembert*, Ca). Mt. Hoffman, Yosemite (*Eastwood* 388, Wa). Black Canyon, White Mts., Mono Co. (*Coville & Funston* 1804, Wa, Ke). Mono Co., Bloody Canyon (*Chestnut & Drew*, Ca). Trail to Mt. Whitney, Tulare Co. (*Culbertson* 4371, Ca). "U. S. Pacific Slope" (*State Survey* 1696, Ca).—All Californian specimens except the northern Californian (*Austin* 428 and *Nutting* without number) belong to var. *gracilescens* Rech. f.

The subgeneric character of separated sexes is not always very evident in this species. I frequently have observed rather more polygamous than entirely pistillate individuals, not so rarely completely staminate.

R. paucifolius agrees in general habit with *R. Acetosa* L. but is easily distinguished by its ovate-lanceolate, entire, never hastate basal leaves. The plant has usually a very strong, tapering root. The panicle is usually contracted and very dense by reason of the often elongate and frequently branched lower branches.

The variability of *R. paucifolius* is limited. Trelease, loc. cit., remarks: "Sometimes with a very minute, rounded callosity." I have not observed such a form, which evidently is very rare. Only in the middle and southern parts of the Californian mountains occurs a form, or perhaps a geographical race, deserving separation:

Var. **gracilescens** Rech. f., nov. var.

Caules numerosi, humiles, 15–20 cm. alti, inflorescentia laxa, folia basalia anguste lanceolata.

The specimens belonging to this variety are indicated in the list of specimens examined.

The area of *R. paucifolius* is limited to the mountainous western districts. In the lower southern and southeastern United States it is replaced by *R. hastatulus* Baldwin apud Elliott. In large regions of the United States occur no indigenous species of the subgenus *Acetosa*.

Explanation of Figure 1.—Rumex paucifolius Nutt.: (*a*), Montana, Flathead Divide, *Jones;* one-half natural size; (*b*), var. *gracilescens* Rech. f., California, *Hall & Babcock* 5456; one-half natural size; valves about 4 times natural size, Oregon, *Cusick* 2651.

6. **Rumex hastatulus** Baldw. apud Elliott. Figure 2

Radix gracilis tenuis perennis sed interdum iam primo anno caulem floriferem emittens. Caules plerumque singuli, (15–) 50 (–80) cm. alti, tenues graciles subflexuosi vel stricte erecti, pallide virides, tenuiter canaliculato-sulcati, internodiis infra inflorescentiam non numerosis saepe ± elongatis. Ochreae albidae vel pallide bruneae hyalinae ± evanescentes. Folia omnia glabra et laevia, plana, consistentia in sicco papyraceo-membranacea, colore pallide viridia, forma valde variabilia. Folia basalia 2–10 cm. longa, 0.3–1.8 cm. lata, obtusiuscula vel acutiuscula, anguste vel latiuscule lanceolata, integra oblongo-linearia vel basi appendicibus brevibus vel elongatis obtusis vel acutiusculis interdum valde divergentibus hastato-sagittata. Nervi secundarii foliorum basalium angulo ca. 30°–40° a mediano abeuntes. Petioli laminae longitudinem ± aequantes. Folia caulina quam basalia multo angustiora et proportione longiora, sursum sensim decrescentia, brevius petiolata, integra vel sagittata. Inflorescentia aphylla laxa diffusa, axis flexuosa, rami tenues flexuosi plerumque singuli nec fasciculati saepius simplices leviter arcuato-divergentes. Florum glomeruli aphylli ± pauciflori omnes remoti. Pedicelli tenuissime filiformes breves, 1.5–2.5 mm. longi, infra medium insensibiliter articulati, perigonio fructifero breviores vel eum ad summum aequantes. Antherae aureae ca. 1 mm. longae, perigonium florum masculorum antheris brevior. Perigonii foliola exteriora anguste lanceolata ca. 0.7 mm. longa basibus interiorum ± laxe accumbentia. Perigonii folia interiora (valvae) in statu fructifero ex emarginatione 2.5–3 mm. longa, 2.7–3.2 mm. lata, colore pallide stramineo-carneo, saepe ± purpureo-suffusa, consistentia tenuissime membranacea, margine subintegra, basi plerumque leviter et latiuscule emarginata, facie tenuissime elevate nervosa, maculis nervaturae centralibus ± isodiametricis, marginalibus valde transversaliter elongatis, nervus medianus ceteris validior sed non callifer. Nux matura fusca nitida, 0.9–1 mm. longa, 0.6–0.7 mm. lata, utrinque brevissime acuminata in medio circiter latissima.

SYNONYMY: *R. hastatulus* Muhl. Cat. ed. 2. 37. 1818, nomen; Baldwin apud Elliott, Sketch Bot. Car. & Ga. 416. 1821, descriptio; Trelease 77. 1892; Britt. & Brown 548. 1896; Small 369. 1903; Gray

FIG. 2. *Rumex hastatulus* Baldw.

357. 1908; Rydb. P. 279. 1932. *R. Engelmannii* Meisn. apud DC. 64. 1856; *R. angustifolius* Engelm. ex Meisn. apud DC. 64. 1854, non Campd.

ILLUSTRATIONS: Trelease 1892, *pl. 14;* Britt. & Brown 548. 1896.

DISTRIBUTION: Eastern and southern United States.

NEW YORK: Long Island, River Head (*E. S. Miller*, Wa, Bu).

NORTH CAROLINA: (*McCarthy*, Wa).

FLORIDA: Old fields, cultivated ground, etc., near Jacksonville (*Curtiss* 2431, Mu, Bu; 4568, H, MW; 4193, Ca; *Hitchcock*, Ch). Vicinity of Eustis, Lake Co., high pine land (*Nash* 400, Ca, Be). Sandy fields near St. Mary's River (*Rugel* 36, Lu). Dry, sandy soil along roadside, Brooksville, Hernando Co. (*Moldenke* 1070, St). Dunes of Santa Rosa Island, in drifting sand (*C. Mohr* 2432b, UW).

ILLINOIS: Sandige Plätze in der Prairie d. American Bottom, gegenüber St. Louis (*Geyer* 538, MW). East Alton, Madison Co. (*McDonald*, P).

ARKANSAS: Fourche Mt., Little Rock (*Wheeler* 58, Ch).

MISSOURI: St. Louis (*Eggert*, Ca, Ko; *Engelmann*, St, Mu, UW, type of *R. angustifolius* Engelm. and *R. Engelmannii* Meisn.; *Geyer*, Be). Bernie (*B. F. Bush* 504, Be).

LOUISIANA: Jacksonville (*Drummond*, Lu).

OKLAHOMA: Sapulpa (*Bush* 1237, P, Be). Limestone Gap (*G. D. Butler* 10, UW).

TEXAS: Industry (*Lindheimer*, comm. *Engelmann*, Ke, Be). Colorado Co. (*J. F. Joor*, De). Giddings(?), Lee Co. (*Egelius*, Z). Dawson, sand (*Reverchon*, SL); Tarrant Co., in sandy pasture land (*Ruth* 464, NY). Between Brazoria and San Felipe (*Drummond* 349, Ke). Houston (*G. L. Fisher*, St). Fayette Co. (*Matthes* 165, MW). Sandy, open ground, Somerville, Burleson Co. (*Palmer* 11695, Ca). Without locality (*Reverchon* 1795, UW; *Drummond*, MW, Lu; *E. Meyer*).

"Nordamerika" (*Engelmann*, MW). "Sandy beach of Pleomie(?) River" (*Young*, NY).

Rumex hastatulus does not vary in form of the fruits but extremely in habit and form of the leaves; but there are no constant combinations of characters nor characters confined to certain regions, so I could not find any basis for distinguishing varieties. Sometimes *R. hastatulus* is able to flower even in the first year, and then gives, because of the slender roots and the absence of leaf remains of the pre-

ceding year, the impression of an annual plant. Such individuals have usually short, slender stems and narrow leaves and are often somewhat similar to *R. Acetosella* L. Robust individuals sometimes have axillary shoots from the lowest nodes. Specimens without the suggestion of hastate basal lobes on the leaves are very rare, but the length, breadth, and direction of the lobes are extremely variable. Staminate plants generally have narrower leaves with shorter basal lobes. The root, especially when compared with that of *R. paucifolius*, is very slender and relatively short, with tiny secondary rootlets. It produces always a single stem; only in luxuriant specimens or if the primary stem is damaged, the stem is branched from the base, giving the impression of a plant with several stems.

The usual interpretation of this species is opposed in one point to Elliott's original description, "Valvae graniferae," for neither Meisner nor Trelease mention a grain-bearing individual, nor have I been able to find any.

As to the name, the *Index Kewensis* cites wrongly *R. hastulatus* Baldwin apud Elliott instead of *R. hastatulus*. The South American *R. hastulatus* Smith in Rees, Cycl. 30: No. 29, 1819, not Baldwin as I cited by error in Vorarb. Rumex Monogr. 3: 4, is, according to *Index Kewensis*, a synonym of *Muhlenbeckia chilensis* Meisn. and has nothing to do with the North American *Rumex* here described.

Explanation of Figure 2.—Rumex hastatulus Baldw.: (*a*), Florida, *Curtiss* 4568; (*b*), Texas, *Drummond* 349; (*c*), North America, *Engelmann;* all one-half natural size. Valves from *Curtiss* 4568, Florida, 4 times natural size.

7. **Rumex venosus** Pursh. Figure 3, *a*

Perennis. Caulis gracilis humilis, 15–30 cm. altus, valde flexuosus, adscendens vel raro suberectus, tenuiter sulcato-striatus, flavescens vel virescens, ut tota planta glaber et levis, a basi plerumque longe et tenuiter flexuoso-ramosus, ramis foliatis saepe elongatis. Ochreae magnae candidae hyalinae margine dilatatae et patentes, diu persistentes. Folia caulina inferiora ambitu ovato- vel obovato-elliptica vel ovato-lanceolata, basi cuneata, apice acuta vel acuminata, margine angustissime papilloso- vel cartilagineo-marginata, latitudine 2–3-plo longiora, ± undata vel fere plana, consistentia in sicco tenuiter coriacea, nervis lateralibus angulo ± 45° a primario abeuntibus, interdum vix conspicuis. Petiolus foliorum inferiorum lamina subbrevior. Folia caulina superiora et folia ramealia inferioribus similia sed proportione minora apice magis acuminata brevius petiolata.

Rami inflorescentiae pauci tenues flexuosi brevissimi, infimus folio suffultus, paniculam parvam contractam formantes. Florum glomeruli pauciflori foliis suffulcrantibus omnino carentes, ± approximati, fructificationis tempore contigui. Perigoniorum fructiferorum pedicelli validiusculi deflexi in medio circiter tenuiter articulati, ad basin perigonii breviter infundibuliformi-dilatati, perigonio maturo breviores. Perigonii foliola exteriora lanceolata acuta, ca. 3 mm. longa, in emarginatione foliorum interiorum reflexa. Perigonii folia interiora (valvae) in statu fructifero ex emarginatione 14–18 mm. longa, 24–30 mm. lata, plana vel leviter undata, basi profunde et anguste emarginata, lobis basalibus sese attingentibus, apice late rotundata vel truncata margine integerrima, consistentia tenuiter membranacea, colore carneo-bruneo, facie tenuiter et creberrime reticulato-nervoso, macula quisque nervaturae primaria iterum crebre reticulato-nervosa. Valvae minime quidem calliferae. Nux matura brunea 5–7 mm. longa, 5–6 mm. lata, basi rotundata, apice acuta supra basin latissima.

SYNONYMY: *R. venosus* Pursh, Fl. Amer. Sept. 2: 733. 1814; Campdera 131. 1819; Hook. 130. 1840; Meisn. apud DC. 43. 1856; Watson 8. 1880; Macoun 415. 1883; Coulter 317. 1885; Trelease 79. 1892; Britt. & Brown 548. 1896; Piper 225. 1906; Gray 355. 1908; Rydb. R. 231. 1903; Jepson 291. 1923; Tidestrom 160. 1925; Rydb. P. 276. 1932.

ILLUSTRATIONS: Campdera 1819, *pl. 2;* Hook. 1840, *pl. 174;* Bot. Jahrb. 15: 270. 1892; Nat. Pflanzenfam. III. 1a: 17. 1892; Trelease 1892, *pl. 17;* Britt. & Brown 548. 1896.

DISTRIBUTION: Basin of the Saskatchewan River, Canada, and western United States from Washington and Nevada to the Missouri River Basin and Texas.

ALBERTA: Sandy banks, Seven Persons Coulee, Medicine Hat (*Macoun* 5882, O).

ASSINIBOIA: Sandy banks, Dunmore (*Macoun* 5883, Wa).

SASKATCHEWAN: Low ground, Swift Current (*Macoun* 23762, O). Clay bank at 12 Mile Creek near Wood Mountain (*Macoun* 12910, O). Sandhills near the Qu'Appelle River (*Macoun* 23763, O). Banks of streams, south of Wood Mountain (*Dawson* 78762, O).

SOUTH DAKOTA: Bad Lands (*Hatcher*, Ca). Black Hills, Custer, 1,650 meters(*Rydberg* 972, Be). Moist draw on prairie near Eastman, Washabaugh Co. (*Over* 2287, Wa).

NEBRASKA: Minden (*Hapeman*, P, Ca, MW). Long Pine (*Rutter*, Wa). Middle Loup River near Thedford, Thomas Co., on railroad

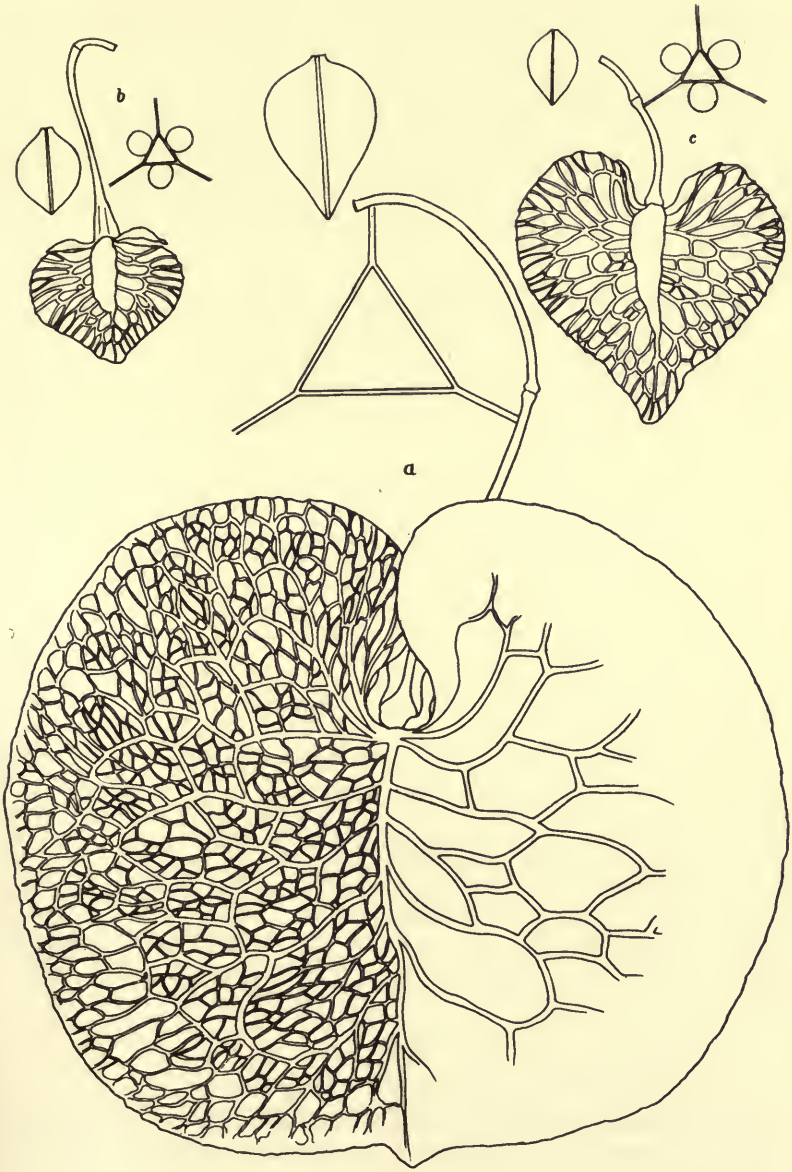

FIG. 3. Valves of (a) *Rumex venosus* Pursh, (b) *R. fascicularis* Small, and (c) *R. spiralis* Small.

bank (*Rydberg* 1288, Be). American Plains, 41° Lat. (*Hall & Harbour* 495, MW).

KANSAS: Manhattan (*Kellerman*, UW, Lu; *Gates*, Ch). Sandy soil, Riley Co. (*Norton* 450, UW). Medora (*Benke* 4273, Ch).

MONTANA: Greycliff, Sweet Grass Co. (*Eggleston* 7865, Ch, SL). Logan, 1,200 meters, Livingston, 1,500 meters (*Blankinship* 742, Be; *Swingle*, P). Upper Missouri, rocky and grassy slopes near the river (?, MW).

IDAHO: Lewiston, Nez Perce Co., 450–600 meters (*Heller* 3155, Ca, Z; *Parker* 304, P). Rocky hillside, valley of Clearwater River, Nez Perce Co. (*Sandberg, McDougal & Heller* 50, Wa, Be). Juniper Hills near St. Anthony, Fremont Co. (*Quayle* 26, La, NY). Deep sand, dry creek bed, 660 meters, Big Willow, Canyon Co. (*Macbride* 178, P, Ca).

UTAH: Salt Lake City, 1,290 meters (*Jones* 1729, Be, Bu). Ogden, along Southern Pacific Railroad embankments, common (*Hall* 10370, Ca). Garfield (*M. E. Jones*, Ca). Kanab (*Jones* 5284, La, Ca). Abundant in drift sand on pinyon hills, Fayette (*Tidestrom* 2096, Wa).

WYOMING: Sand dunes, Sand Creek, Albany Co. (*A. Nelson* 6981, Wa, Ke, Be). Laramie (*A. Nelson* 156, Ca). Laramie Hills (*A. Nelson* 1958, St). City Springs, Laramie (*A. Nelson* 4353, Ca). Depressions, loose soil, Laramie Hills (*Spalding* 154, St).

COLORADO: Colorado Springs (*Eastwood*, Ca). Denver (*Eastwood*, Ca, Lu; *Clokey* 3094, La). Between Colorado Springs and Denver (*Jones* 177, Wa, Be, Bu). Parkers, prairie near Denver, 1,800 meters (*Henry*, Be). Tobe Miller's Ranch (*Hb. State Agr. Coll. Colo.* 3844, Wa, Be, Lu, P). Canyon City, Fremont Co. (*Brandegee* 900, Ca). Plains, Cheyenne (*Vasey* 499, Ke, Be). Custer Co., chiefly from about 2,400 meters (*Cusack*). Fort Collins (*Baker*, Be). Plains of northern Colorado (*Greene*, MW). La Veta (*Rydberg & Vreeland* 6329, La).

NEW MEXICO: (*Fendler* 758, Ke).

TEXAS: (*Reverchon*, Wa).

WASHINGTON: Whitman Co., one mile from Wilma (*C. F. Lackey*, MW). Whitman Co., Wawawai (*Elmer*, Z). Truax (*St. John* 5905, P). Central Ferry (*St. John* 6037, P). Spokane Co., Hangman Creek, 460 meters (*Sandberg & Leiberg* 28, P, Ca, Wa, St, Ko, Le). Yakima Co., Satus Station, 150 meters (*Heidenreich* 91, P). Yakima Region, light soil, Washtucna(?), Adams Co. (*Cotton* 981, P, Wa). Yakima region, sandy soil near laterals, Sunnyside (*Cotton* 382, P, Be). Near

Wenatchee, Kittitas Co. (*Whited* 1224, Wa). Moses Lake, Douglas Co., 390 meters (*Sandberg & Leiberg* 374, P, Ca, St, Ko). Klickitat Co., sandy places, Columbia River (*Suksdorf* 896, Ca, Mu, Be). Sandbanks, Columbia River (*Howell*, P, Be, Bu, Mu). Barren, sandy grounds in the interior, Columbia River (?, Ke). Paradise Valley, Humboldt Co. (*Train*, P). Pasco (*Piper* 2983, P; *Heidenreich*, P). Rattlesnake Hills, Benton Co. (*Bennett*, P). Almota (*Piper* 1549, 2940, P). "The Junipers," near Fishook, Franklin Co. (*Cotton*, P). Above mouth of Grande River (*St. John & Brown* 3844, P). Attalia (*Beattie* 3923, P). Rocklyn, Lincoln Co. (*Mielke*, P). Wenatchee (*Whited*, P). Central Washington (*Vasey* 33, P).

OREGON: Dry, rocky bed of vernal stream near Malheur River, rare (*Cusick* 2552, P, Ca, Be, Z, MW). Sandy waste, 4 miles east of the Dalles, Wasco Co. (*Thompson* 4084, Wa). Columbia River, Lat. 46°–49°, Dalles (*Lyall*, Be). Damp, alkaline ground, southeast of Keno, Klamath Co. (*Peck* 2394, Ke).

NEVADA: Wadsworth (*Grunow*, MW). Esmeralda Co., Belleville, open sand (*Shockley* 223, Ca). North of University, Reno (*Thomas*, Ca).

CALIFORNIA: Sheridan (*Smith*, P).

This species is so different from all others that it must be considered as representing a special subsection of the section *Axillares*. The valves, 24–30 mm. broad when ripe, are the largest known in the whole genus. In this respect *R. venosus* may, within the subgenus *Lapathum*, be compared only with *R. macranthus* Boiss. of western Asia, and within the subgenus *Acetosa* with representatives of the section *Vesicarii* from the southern parts of the Mediterranean Basin. The first is very different from *R. venosus* in the sectional vegetative characters; the last-named group, moreover, in the subgeneric sexual characters.

Explanation of Figure 3, a.—Valves of *Rumex venosus* Pursh, 4 times natural size.

8. **Rumex verticillatus** L. Figure 4

Perennis. Caulis erectus 40–100 cm. altus, gracilescens, leviter anguloso-flexuosus, tenuiter sed profunde canaliculatus, saepe purpurascens, ex axillis foliorum vel e radicis collo ramos breves vel elongatos foliosos vel fasciculos foliorum proferens. Ochreae pallide bruneae hyalinae cylindricae ad nodos inferiores usque 5 cm. longae. Folia omnia in sicco tenuiter papyracea, plana, glabra et levia, sub lente tantum minutissime et sparse papilloso-punctata, nervis secun-

dariis leviter curvatis a primario angulo ca. 45°–60° abeuntibus. Folia infima lineari-lanceolata, basi cuneata, apice acuta, latitudine ca. 5–7-plo longiora; petiolus foliorum basalium tertiam circiter partem longitudinis laminae aequans. Folia caulina anguste linearilanceolata, latitudine 6–9-plo longiora, utrinque aequaliter fere angustata, plana vel subundata, brevius petiolata; petiolus latitudinem folii circiter aequans. Folia caulina superiora et folia ramealia inferioribus similia sed proportione minora angustiora brevius petiolata. Rami inflorescentiae ± breves tenues flexuosi singuli simplices ± arcuato-divergentes, infimi tantum ex axillis foliorum orientes, paniculam parvam apertam formantes. Florum glomeruli multiflori omnes ± remoti vel superiores approximati, omnes foliis suffulcrantibus carentes. Perigoniorum fructiferorum pedicelli validi rigidi longissimi, prope basin incrassato-articulati ibique deflexi, basin perigonii versus sensim dilatati et sulcato-alati, perigonio maturo 3–5-plo longiores. Perigonii foliola exteriora anguste linearilanceolata acuta, ca. 2.5 mm. longa, marginibus interiorum arcte appressa. Perigonii folia interiora (valvae) in statu maturo 4–5 mm. longa, 2.5–4 mm. lata, pallide brunea, tenuiter coriacea, basi rotundato-dilatata, apice in linguam angustam acutam producta, margine integra, facie irregulariter scrobiculato-rugosa vel fere transversaliter calloso-plicata plicis irregulariter anastomosantibus, omnia callifera. Calli subaequales angusti valde prominentes, latitudine usque 4-plo longiores, lateraliter ad basin transverse rugosa, ceterum sub lente minutissime celluloso-punctati. Nux matura brunea ca. 3 mm. longa, ca. 1.8 mm. lata, basi brevius, apice paulo longius acuminata, vix infra medium latissima.

SYNONYMY: *R. verticillatus* L. Sp. Pl. 334. 1753; Michx. 217. 1803; Pursh 248. 1816; Campdera 98. 1819; Meisn. apud DC. 47. 1856; Macoun 416. 1883; Trelease 85. 1892; Britt. & Brown 549. 1896; Small 369. 1903; Gray 356. 1908; Rydb. P. 280. 1932.

ILLUSTRATIONS: Trelease 1892, *pl. 23;* Britt. & Brown 549. 1896.

DISTRIBUTION: Lower parts of southeastern Canada and the eastern and middle United States.

QUEBEC: L'Ile de Montréal, Saint-Laurent (*Adrien* 1073, St). Environs de Montréal, Longueil, rive du St. Laurent (*Rolland-Germain* 29205, St). St. Blaise, Saint-Jean, sur les bords marécageux du Richelieu (*Marie-Victorin* 28343, Br). Environs d'Ottawa (*Marie-Victorin* 10073, Wa). River shore swamp, Aylmer (*Harrington* 1908, O). Bell's Lake, Wakefield (*Macoun* 80838, O). Saint-Joseph (*Adrien* 1483, St).

FIG. 4. *Rumex verticillatus* L.

ONTARIO: Cunnings Bridge, Ottawa, ditches (*Macoun* 5881, O). Billings Bridge near Ottawa (*Macoun* 80837, Be). In marsh at Malloch's Bay, Ottawa River, above Ottawa (*Macoun* 60810, O). Marsh above Brittania (*Macoun* 83599, O). Near Belleville, swamp and ditches (*Macoun* 23761, O). Niagara River, Dunnville (*Macoun* 54769, O). Swampy river shores, Brittania (*Harrington* 1908, O).

VERMONT: Banks of Big Otter Creek, swampy places (*Morong*, NY).

NEW YORK: Ithaca (*Rowlee*, Wa; *Malte*, Lu; *Muenschler & Bechtel*, P). Swampy ground along Grass River, Canton (*Phelps* 394, Wa). Marshy margin of outlet to Black Lake, Oswegatchie (*Phelps* 1402, Wa). Without locality (*Wright*, Bu).

PENNSYLVANIA: (*Bernhardi* in 1837, Bu; *Muhlenberg*, St, Mu).

MARYLAND: In swamp, Chesapeake Beach (*Tidestrom* 1116, Wa).

VIRGINIA: Ocean View, Norfolk Co. (*Kearney* 1216, Wa). Wet woods, along Plankatank River, 2 miles north of Glens Forks, Middlesex Co. (*Leonard & Killip* 32, Wa). Mucky edge of cypress swamp, Virginia Beach (*Sudworth*, Wa).

SOUTH CAROLINA: Shell Creek opposite Port Royal Sound (*Harris* 2124A, Wa). Moist ditch south of Charleston, Charleston Co. (*Moldenke* 1211, St). Porcher's Bluff, Christ Church Parish, Charleston Co. (*Mearns* 38, Wa).

FLORIDA: McIntosh (*Miller* 508, Wa). In fossis prope St. Marks (*Rugel*, NY, Lu). Swampy soil, Fort Myers, Lee Co. (*Moldenke* 953, St). Miry meadows along St. Augustine Branch, Tallahassee (*Harper*, Wa). Miami (*Hitchcock*, Ch).

OHIO: St. Marys, swamps (*A. Wetzstein*, Univ. Graz). Cleveland (*Krebs*, Be). Ohio (*Frank*, Z).

TENNESSEE: In paludosis ad French Broad River prope La Dandridge (*Rugel*, MW).

ALABAMA: Montgomery (*C. Mohr*, Wa). Mobile (*Baker*, NY).

ILLINOIS: Algonquin (*Vasey*, Bu). Swan Lake near Grafton, Calhoun Co. (*Metcalfe* 1114). Illinois (*Eggert* 294, Be, Bu, Z). Cahokia (?, Lu). Without locality (*Vasey*, MW, Bu).

INDIANA: Knox Co. (*Spillman* 161, P).

IOWA: Moore, in shallow water of ponds (*Conard*, MW).

MISSOURI: St. Louis, wet places (*Engelmann*, Be; *Eggert*, Ko; *Drummond* 143, Ke). Courtney, swamps (*Bush* 3979, Wa). Slough, Wayland, Clark Co. (*Metcalfe* 1095, Wa). Jerome (*Kellogg* 516, Wa). Mexico, Audrain Co. (*Palmer & Steyermark* 40792, MW).

ARKANSAS: Big Lakes, Hornersville (*Metcalfe* 640, Wa).

LOUISIANA: Gretna, opposite New Orleans, swampy woods (*Ball* 338, Wa).

TEXAS: San Felipe (*Drummond*, Lu). Galveston (*Lindheimer*, Be). Houston, Harris Co. (*Dixon* 623, Ch). Without locality (*Reverchon*, Be).

R. verticillatus forms, together with *R. floridanus* Meisn. and *R. fascicularis* Small, a very natural group, the subsection *Verticillati*. *R. verticillatus* and *R. floridanus* are not always easily distinguishable from each other. As to the differential characters, see under the latter species. Perhaps it would be better to reduce *R. floridanus* and *R. fascicularis* to subspecies of *R. verticillatus*.

Explanation of Figure 4.—Rumex verticillatus L., about one-half natural size, from *Macoun* 83599, Ontario. Valves 4 times natural size, from *Macoun* 83598.

9. **Rumex floridanus** Meisn. Figure 5

Perennis. Caulis 40–80 cm. altus, firmus subfistulosus, profunde sulcato-canaliculatus, plerumque atropurpureus, iam infra medium ramos foliosos breves serius elongatos floriferos proferens. Ochreae magnae pallidae hyalinae cito evanescentes. Folia omnia in sicco crassiuscule papyracea interdum subcoriacea rigidula, plana, glabra et laevia, sub lente tantum minutissime et sparse punctulata, nervis secundariis leviter curvatis, angulo ± 60° a primario abeuntibus. Folia caulina ad 20 cm. longa, 5 cm. lata, late lanceolata, latitudine 3–5 (–6) -plo longiora, utrinque subaequaliter angustata, plana. Petiolus latitudinem laminae subaequans. Folia caulina superiora et ramealia sensim minora, summa imprimis angustiora. Rami inflorescentiae breves raro infimi elongati tenues sed tenaces, singuli simplices, infimi tantum folio suffulti, paniculam parvam ± contractam formantes. Florum glomeruli multiflori in statu fructifero omnes contigui, infimi interdum paulum remoti, omnes foliis suffulcrantibus carentes. Perigoniorum fructiferorum pedicelli validi rigidiusculi prope basin incrassato-articulati, ibique deflexi, basin perigonii versus sensim dilatati et sulcato-alati, perigonio maturo (1.5–) 2 (–3) -plo longiores. Perigonii foliola exteriora anguste lineari-lanceolata basibus interiorum appressa, ca. 2.5 mm. longa. Perigonii folia interiora (valvae) in statu maturo 4–5.5 mm. longa, 4.5–6 mm. lata, longitudine semper evidenter latiora, basi truncata, apice breviter acuminata margine integra facie prominenter reticulato-nervosa, maculis nervaturae marginalibus valde elongatis, color valvarum

fructiferarum atro- vel fusco-bruneus, consistentia rigide coriacea. Valvae omnes calliferae; calli subaequales angusti valde prominentes, 3–4 mm. longi, ca. 1 mm. crassi, plerumque rugulosi. Nux matura atro-brunea, 2.5–3.5 mm. longa, 2–3 mm. lata in vel paulum infra medium latissima, basi breviter, apice sublongius acuminata.

SYNONYMY: *R. floridanus* Meisn. apud DC. 46. 1856 (non *R. floridanus* Trelease 86. 1892).

DISTRIBUTION: Eastern and southeastern United States.

NEW JERSEY: Cape May Co., near Wildwood (*Pollard*, Wa, St). Paterson, above the falls of Passaic River, Passaic Co. (*Rabenau*, Lu).

DELAWARE: Wet woods near Milton, Sussex Co. (*Britton* 46, NY).

GEORGIA: Altamaha Grit, Darien, McIntosh Co. (*H. H. Smith* 2158, MW).

FLORIDA: Alva, ditch, Lee Co. (*Hitchcock* 301 or 307, NY, Wa). Fort Myers (*Hitchcock*, Ch). Pondillo, moist thicket, vicinity of Fort Myers, Lee Co. (*Standley* 52599, Wa; no fruits). Titusville, Brevard Co. (*Nash* 2286, Wa, Ke, Be, Le, UW). Near Jacksonville (*Curtiss* 4850, Wa). In fossis et ad fluvium prope St. Marks (*Rugel*, MW). Without locality (*Vasey*, Wa).

ALABAMA: Borders of ditches, marshes, ponds, muddy banks, etc., Mobile (*Mohr*, Wa, Be). Cedarpoint (*Mohr*, Ch).

LOUISIANA: New Orleans (*Drummond* 280, Lu, Ke; *Hitzer*[?], UW). Vicinity of Lake Charles (*Allison* 133, Wa, SL). Along a ditch of saltish water, Côtes Blanches, St. Mary Co. (*Langlois*, Wa), Mississippi Delta and adjacent islands (*Lloyd & Tracy* 131, Wa. NY, MW).

Rumex floridanus is very similar to *R. verticillatus* L. It differs from the latter by the following characters: shorter, broader leaves of somewhat leathery consistency, more robust stem, denser fruiting panicle, shorter fruiting pedicels (being in pressed plants not so conspicuous as in *R. verticillatus*), valves broader than long, and by the darker color of the whole plant, especially of the fruiting perigonia. The fact that these characters occur in most cases combined, and limited to the southeastern United States, seems to confirm the specific distinction of the two types, even if in some cases one or another of the characters is not so decided.

I have not seen Meisner's type specimen, but there can not be any doubt about the identity of his plant with the one here described. The following remarks from Meisner's description confirm it sufficiently: "Racemis continuis . . . demum densis . . . pedicellis subduplo

FIG. 5. *Rumex floridanus* Meisn.

longioribus. . . valvis demum latioribus quam longis. . . differt a *R. verticillato* pedicellis brevioribus, valvis basi truncatis distinctius reticulatis."

Trelease, op. cit. 86. *pl. 24*, describes and figures under the name of *R. floridanus* a quite different plant (*R. Berlandieri* Meisn.), as Small, Bull. Torrey Club 23: 405, has already pointed out.

Explanation of Figure 5.—Rumex floridanus Meisn., one-half natural size; *Curtiss* 4850, Florida. Valves 4 times natural size, from *Nash* 2286.

10. **Rumex fascicularis** Small. Figure 3, *b*

Perennis. Radices fibrae 3–5 fusiformi-incrassatae 5–10 cm. longae. Caulis 50–60 cm. longus decumbens vel adscendens gracilis subfistulosus flaccidus ± flexuosus profunde sulcato-striatus; internodia media elongata ad 12 cm. longa, inferiora et superiora brevia. Caulis e nodis mediis ramos abbreviatos foliosos verosimiliter serius florentes emittens. Ochreae hyalinae mox evanescentes. Folia caulina inferiora ignota. Folia caulina media ad summum 20 cm. longa, 9 cm. lata in vivo crassa (ex auctore) in sicco tenuiter papyraceo-membranacea, e basi leviter cordata ovata vel oblongo-ovata, apice acuta, latitudine ± duplo longiora, in quarta vel tertia parte inferiore latissima. Foliorum lamina plana glabra levis, sub lente in sicco minutissime flavido-punctulata. Nervi secundarii leviter arcuati a primario angulo ca. 70°–80° abeuntes. Petiolus dimidiam latitudinem laminae aequans vel paulo superans. Folia ramealia caulinis similia sed paulo minora. Panicula laxa aperta; axis saepe anguloso-flexuosa; rami fructiferi singuli plerumque simplices, tenues, ab axi principali angulo ± 45° abeuntes, sulcato-striati, flexuosi, omnino aphylli. Perigoniorum fructiferorum pedicelli prope basin tenuiter articulati, longissimi, perigonio 3–4-plo longiores ab articulatione stricte deflexi, basin perigonii versus sensim paulo incrassati et subalato-sulcati. Perigonii foliola exteriora lineari-lanceolata, dimidiam latitudinem interiorum paulum superantia, apice incurva, ca. 3 mm. longa, marginibus interiorum appressa. Perigonii folia interiora (valvae) in statu fructifero late rotundato-triangularia vel subcordata, partim longitudine latiora, 4–5 mm. longa et lata, apice acuta vel rotundato-acuminata vel interdum paulum liguliformi-producta, margine integra vel obsolete subcrenata. Facies valvarum tenuiter reticulato-venosa. Maculae nervaturae marginales valde elongatae. Valvae ± tenuiter membranaceae, omnes calliferae; calli subaequales ovato-fusiformes valde prominentes, latitudine 3-plo fere longiores, minute impresse punctulati, insuper transverse rugosi.

Nux brunea, 2–2.5 mm. longa et lata, marginata, apice breviter acuminata, paulo infra medium latissima, longitudine interdum paulo latior.

SYNONYMY: *R. fascicularis* Small, Bull. Torrey Club 22: 367. 1895; Small 369. 1903.

ILLUSTRATION: Bull. Torrey Club 22: *pl. 246*.

FLORIDA: Vicinity of Eustis, Lake Co., cypress swamps (*Nash* 898, Wa, NY; type).

R. fascicularis is nearly related to *R. verticillatus* L. and *R. floridanus* Meisn. It is similar to these species especially in the pedicels and fruiting perigonia, but differs from both remarkably by the much broader and shorter leaves, these being at most twice as long as wide and slightly cordate at the base, with long petioles, and lateral nerves that form a less acute angle with the midrib, and by the lower and more slender stem. I can not decide whether fusiform-incrassate root fibers form a differential character against *R. verticillatus* and *R. floridanus*, because I had no opportunity to study the subterranean parts of the latter species.

Besides the type number, I saw only one specimen possibly belonging to *R. fascicularis:* Ohio, Middletown (*Riddell*, Wa). In habit it is similar to *R. fascicularis*, but differs from the type by its somewhat narrower leaves, broadly rounded at the base, and by its shorter petioles. The specimen is in these respects an intermediate between *R. fascicularis* and *R. floridanus*.

Explanation of Figure 3, b.—Valves of *Rumex fascicularis* Small, 4 times natural size, from *Nash* 898.

11. **Rumex spiralis** Small. Figure 5, *c*

Perennis ("rootstock woody, creeping 1–2 dm. long, roots fibrous" ex auctore). Caulis ascendens vel erectus purpurascens tenuis gracilis ± flexuosus, tenuiter sed profunde canaliculato-sulcatus, a basi fere ex axillis foliorum ramos foliosos serius elongatos emittens, 60–90 cm. altus. Ochreae magnae albidae hyalinae cylindricae diu persistentes. Folia in sicco consistentia tenuiter papyracea, colore pallide viridi, basin versus interdum leviter undulato-crispata, ceterum fere plana, utrinque glabra et levia, sub lente tantum minutissime punctulata. Nervi secundarii foliorum tenues, vix arcuati angulo 50°–60° a primario abeuntes. Folia caulina inferiora ovato- vel oblongo-lanceolata, basi rotundata vel truncata, apicem versus sensim attenuata, 10–15 cm. longa, 3.5–5.5 cm. lata, latitudine 2.5–3.5-plo longiora, in tertia circiter parte inferiore latissima, petiolata.

Petioli latitudinem folii subaequantes. Folia caulina superiora multo angustiora, latitudine 4–6-plo longiora, basi cuneata, apice longius angustata, petiolus latitudine laminae ± longior. Rami inflorescentiae tenues flexuosi singuli simplices, angulo 40°–60° ab axi principali divergentes, omnino aphylli, breves, infimi interdum paulum elongati ad 12 cm. longi. Florum glomeruli multiflori, omnes fere approximati, in statu fructifero contigui, foliis suffulcrantibus omnino carentes. Perigoniorum fructiferorum pedicelli tenues, (2–) 3–5 mm. longi, in vel infra medium incrassato-articulati, ad basin perigonii nodoso-incrassati, perigonio fructifero semper multo breviores. Perigonii foliola exteriora anguste lanceolato-linearia, ca. 2.5 mm. longa. Perigonii folia interiora (valvae) in statu fructifero ex emarginatione 7–8 mm. longa, 8–12 mm. lata, longitudine semper latiora, basi profunde emarginata, apice acuminata, ambitu late cordata, margine integra, facie prominenter pulchre subregulariter reticulato-nervosa, consistentia coriaceo-membranacea, colore pallide rufo-brunea. Valvae omnes calliferae, callus valde prominens, anguste fusiformis, ca. 5 mm. longus, ca. 1–1.3 mm. crassus, in nervum medianum valvae sensim transiens, rugulosus. Nux matura atrofusca ad angulos anguste pallide marginata, 3 mm. longa, ± 2.2 mm. lata, basi fere rotundato-truncata, apice breviter acuminata, infra medium latissima.

SYNONYMY: *R. spiralis* Small, Bull. Torrey Club 22: 44. 1895; Small 370. 1903.

ILLUSTRATION: Bull. Torrey Club 22: *pl. 228.*

TEXAS: Kenedy, Karnes Co., 120 meters (*Heller* 1781, Ca, Wa, Ke; no fr., type). San Antonio, edge of lake (*Schultz* 151, Wa; the leaves narrow, 5 times as long as broad).

This species has the largest fruiting perigonia and the largest nutlets of the subsection *Salicifolii* and may be recognized easily by these characters. *R. spiralis* is, so far as known, strictly limited to Texas, and seems to be a rare plant.

Explanation of Figure 3, c.—Valves of *Rumex spiralis* Small, 4 times natural size, from *Heller* 1781, Texas.

12. **Rumex altissimus** Wood. Figure 6

Perennis. Caulis erectus ad 80 cm. altus validus subfistulosus flexuosus vel strictus, plerumque atropurpureus, profunde sulcato-canaliculatus, a medio vel infra ramos foliosos serius valde elongatos et floriferos emittens. Ochreae magnae albidae hyalinae evanescentes. Folia omnia in sicco colore pallide virescenti, consistentia

rigide papyracea, plana, glabra et laevia, sub lente tantum minutissime punctulata, nervis secundariis tenuibus vix curvatis angulo ca. 50–60° a primario abeuntibus. Folia caulina inferiora late vel ovato-lanceolata vel oblongo-lanceolata, 12–18 cm. longa, 4–5.5 cm. lata, latitudine 2.5–4-plo longiora, infra medium latissima, basi late cuneata vel subrotundata, apice sensim angustata, petiolata. Petioli dimidia latitudine folii breviores. Folia caulina superiora et folia ramealia minora brevius petiolata, basi angustius cuneata, apice brevius acuminata. Rami inflorescentiae ± breves singuli simplices, rarius inferiores elongati iterum ramosi, angulo 45° ab axi principali divergentes, leviter arcuati, subflexuosi, infimi tantum foliis suffulti, paniculam apertam formantes. Florum glomeruli multiflori, in statu fructifero plerumque omnes contigui, rarius infimi remoti, omnes foliis suffulcrantibus carentes. Perigoniorum fructiferorum pedicelli validiusculi, in quarta circiter parte inferiore incrassato-articulati, ad basin perigonii subito paulum dilatati, perigonio fructifero subbreviores vel subaequilongi, raro paulo longiores. Perigonii foliola exteriora anguste lanceolata acutiuscula dimidiam latitudinem valvae subaequantes. Perigonii folia interiora (valvae) in statu maturo 4–6 mm. longa, 3–4 (–5) mm. lata, ambitu ovato-scutiformia basi truncata vel cordata apice acuta, margine integra vel subintegra, facie tenuiter prominenter subregulariter reticulato-nervosa, maculis nervaturae subaequalibus marginalibus vix elongatis. Color valvarum maturarum olivaceo-bruneus, consistentia tenuiter rigide coriacea. Valva unica vel omnes saepe valde inaequaliter calliferae. Callus ovato-fusiformis valde prominens ± 3 mm. longus, ± 1 mm. crassus laevis vel subrugosus, bruneo-aurantiacus. Nux matura atrofusca ca. 3 mm. longa, ca. 2 mm. lata, basi breviter, apice sublongius acuminata, vix infra medium latissima.

Synonymy: *R. altissimus* Wood, Class Bk. ed. 2: 477. 1847; Proc. Amer. Assoc. Adv. Sci. 1853: 177. 1856; Trelease 86. 1892; Britt. & Brown 549. 1896; Small 370. 1903; Gray 356. 1908; Woot. & Standl. 192. 1915; Rydb. R. 232. 1922; Rydb. P. 280. 1932. *R. Britannica* Meisn. apud DC. 47. 1856; Gray, Manual, editions prior to the sixth, non L. ex Gray, Proc. Amer. Acad. 8: 399. *R. Britannica β polygonifolius* Loudon ex Meisn. apud DC. 47. 1856.

Illustrations: Trelease, 1892, *pl. 25;* Britt. & Brown 549. 1896.

Distribution: Lower parts of the eastern and middle United States to Arizona.

New Hampshire: Shelburne, border of wet field, roadside (*Deane*, Wa).

FIG. 6. *Rumex altissimus* Wood.

NEW YORK: Along abandoned railway to marble quarry, Gouverneur (*Phelps* 1144, Wa; 3 grains).

PENNSYLVANIA: York Furnace (*Britton*, MW; no ripe fr.). Meadville, Crawford Co. (*Garber*, Wa).

NEW JERSEY: Passaic (*Ruth*, Wa; no ripe fr.).

MARYLAND AND DISTRICT OF COLUMBIA: Washington, D. C., alluvial ground (*Steele* 22, UW; no ripe fr.). Canal bank above Chain Bridge (*Maxon & Standley* 345, Wa; no ripe fr.). River flats near Glen Echo (*House* 832, Wa; no ripe fr.). On flats at mouth of Scotts River (*Holm*, St). High Island, Potomac, Montgomery Co. (*J. D. Smith*, Wa).

VIRGINIA: Virginia side of Potomac River from opposite Analostan Island to Chain Bridge (*E. L. Morris* 67, Wa; no ripe fr.). Wet places, Little Falls of Potomac River (*C. Mohr*, Wa; 3 grains).

WEST VIRGINIA: Sandy shores of Ohio River near Wheeling (*Mertz*, Wa).

GEORGIA: Augusta (*Cuthbert*, NY; 3 grains).

MICHIGAN: Bryant's, Cheboygan Co. (*Gates* 10533, Ch; 3 grains).

INDIANA: Pine (*Duesner*, Ch; no ripe fr.). Dune region (*Peattie* 2283, Ch). Miller (*Mason Bross*, Ch).

OHIO: St. Mary, borders of streams (*A. Wetzstein*, Univ. Graz). Near Cincinnati (*Lloyd* 1993, H, Z, Lu, Bu, Cl; no ripe fr.). Ohio State Univ. Bot. Gard., Columbus (*Condit*, Ca). Cincinnati, meadows (*Lea* 11). Without locality (*Frank*, MW, H, Mu; no ripe fr.).

KENTUCKY: Paducah, McCracken Co. (*Eggleston* 4450, NY, De; no ripe fr.). Bank of Elkhorn (*Singer* 135, Wa; no ripe fr.). Without locality (*Matthes* 114, 227, MW, Be; comm. *Hooker* 837, MW, Be).

ALABAMA: Mobile, marshes (*C. Mohr*, SL; no ripe fr.). Mobile, border of swamp and ditch (*C. Mohr*, Wa).

WISCONSIN: Fort Howard, Brown Co., in moist or wet clay (*Schuette*, Ca, Ch, MW). Grant Co. (*Hasse*, Ca; no ripe fr.). Mazomanie (*Hall*, Ca).

MINNESOTA: Vicinity of Minneapolis, roadsides (*Sandberg Exch. Bur.*, Ca; 3 grains). Fort Snelling (*Mearns* 830, Wa; 3 grains). Minneapolis, wayside (*Aiton*, Ca; 3 grains).

IOWA: Ames (*Arthur*, MW; *Pammel*, NY, Wa; *Hitchcock*, Ca; *Combs & Ball* 514, Ke). Fayette Co. (*Fink*, Wa). Mt. Pleasant (*Longnecker*, La).

ILLINOIS: Wet places near Chicago (?, Wa). Grassy, vacant lots, Chicago (*Lansing* 246, Mu). Jackson Park, Chicago (?, 850, Lu).

Stony Island, Chicago (*Greenman* 2613, Wa, NY, Ke; 3 grains). Banks of the Mississippi, Oquawka (*Patterson*, Be). Marseilles (*Johnston*, Wa; no ripe fr.). Fountaindale, Winnebago Co. (*Bebb* 4, Wa, Mu). St. Clair Co. (*Mendel*, Z). Lisle, along stream (*Martmick?*, Wa; no ripe fr.). Rich soil, Wooded Island, Starved Rock, La Salle Co. (*Greenman, Lansing & Dixon* 106, Ca, Ke, MW; no ripe fr.). Vicinity of Kankakee, wet roadside (*Crampton* 116, Wa; no ripe fr.) and rocky bank (*Crampton* 373, Wa; 3 grains). Stark Co., bottomland (*Chase*, Wa; no ripe fr.). Freeport (*F. Johnson*, MW; no ripe fr.). Algonquin (*Vasey*, UW). Port Byron (*Harper*, P).

MISSOURI: St. Louis (*Engelmann*, Be, H; 3 grains). St. Louis, wet places (*Eggert*, Wa; 3 grains). St. Louis, waste ground (*Trelease*, Ko; 3 grains). Low grounds east of Missouri Bot. Garden, St. Louis (*Douglas*, Lu; no ripe fr.). St. Louis, bords des ruisseaux (*Riehl* 397, MW, Be; no ripe fr.). Am Mississippi (*Eggert* 293, Be, Bu, Z). Courtney, bottoms (*Bush* 541, 9773A, Ke, Be). Vicinity of Springfield, along the Jordan, east of town (*Standley* 9717, Wa; no ripe fr.). Vicinity of Springfield, southeast of town (*Standley* 8347, Wa; no ripe fr.). Independence (*Bush* 8, Ca). Allenton (*Letterman*, Ca; no ripe fr.).

LOUISIANA: Near New Orleans (*Matthes* 307, MW; no ripe fr.).

NEBRASKA: Ponca (*Clements* 2544, Wa; no ripe fr.). Lancaster Co. (*Milligan*, Wa).

KANSAS: Miami Co., along road between Olathe and Pleasanton (*Rydberg & Imler* 55, NY). Low ground, Riley Co. (*Norton* 451, MW). One mile northeast of Montana (*Rydberg & Imler*, NY). Five miles from Osborne City, draw bottom (*Shear* 86, Wa).

OKLAHOMA: Beaver Co., Knowles, margin of shallow pond (*G. W. Stevens* 517, Wa, Ke; no ripe fr.). Stillwater (*Waugh* 141, Wa; *C. M. Morris*, Univ. Graz; *Myers* 61, Lu). Mannsville, Johnston Co., margin of pond (*Florence Griffith* 3459, G; no ripe fr.). Norman (*Reed*, Z; no ripe fr.).

TEXAS: Tarrant Co., low, damp ground near Texas Christian Univ. (*Ruth* 604, NY, Ca). Bed of dry stream, Fort Worth (*Ruth* 123, NY, Wa). Wet, open ground, Bryan, Brazos Co. (*Palmer* 11738, SL, La, Ca, MW, Br). Wet places near Comanche (*Eggert*, SL; no ripe fr.). Wet places near Longview (*Eggert*, SL; no ripe fr.). Sonora, 660 meters (*G. L. Fisher* 2330, MW). Willis, waste places (*S. R. Warner*, SL; no ripe fr.). Dallas, damp, rich soil (*Reverchon* 796, SL); and in upland, common (*Reverchon* 2523, SL; no ripe fr.). Fort Worth (*Ruth* 41, Ch). Texline (*Griffiths* 5634, Wa). Valley,

Gillespie Co. (*G. Jermy* 740, SL; leaves only). Without locality (*Thompson*, SL).

COLORADO: Foothills near Golden, 950 meters (*Jones* 270, Bu; no ripe fr.).

NEW MEXICO: Mangas Springs, 18 miles northwest of Silver City, Grant Co., 1,430 meters (*Metcalf* 775, La, Wa). Santa Rosa, 1,400 meters (*Arsène* 17027, MW).

ARIZONA: Benson (*Peebles & Loomis* 5452, Wa; no ripe fr.). Rincon Mts. (*Toumey* 280, NY).

INTRODUCED TO EUROPE: Denmark: Kjöbenhavn, Plodsved Island Brygge (*S. Andersen*, Ko).—Sweden: Småland, Kalmar (*Ekstrand*, St). Göteborg, Gamlestaden (*H. Fries*, St).

Rumex altissimus can be distinguished at once from *R. mexicanus* Meisn. by its broadly ovate (never linear) -lanceolate, elegantly acuminate leaves, recalling those of certain species of *Polygonum*, and by its larger fruiting perigonium segments with elliptic-cordate (never triangular) outline, usually bearing only one grain.

The most common type of *R. altissimus* has fruiting perigonia with only one segment bearing a grain, the others being naked. This corresponds with Wood's description of *R. altissimus:* "sepalis . . . una vel duabus tuberculatis." The var. *abortivus* Peattie, Amer. Midl. Nat. 10: 130. 1926, coincides therefore with the type. Specimens with fruiting perigonia bearing three grains are much rarer; the grains are then of very unequal size. Individuals with three equal grains are very rare.

I have not seen the type of *R. altissimus* Wood and accept here the usual interpretation of this species by Trelease and subsequent authors. But I must call attention to the following parts of Wood's description: "Foliis anguste lanceolatis . . . utrinque angustatis," which seems to make this interpretation doubtful. Earlier authors seem to have confounded this species with *R. Britannica* L. I suspect that Campdera (99. 1819) may have described it under *R. Claytonii*, but unfortunately I have failed to see Campdera's types.

Explanation of Figure 6.—Rumex altissimus Wood, about half natural size; cultivated at Stockholm, from seeds from the District of Columbia, *Holm*. Valves 4 times natural size, from *Crampton* 373.

13. **Rumex ellipticus** Greene. Figure 7

Perennis. Caulis procumbens vel adscendens, tenuis sed firmus, internodiis brevibus, valde flexuosus, tenuiter sulcato-striatus, pur-

purascens, a basi crebre iteratim ramosus. Rami valde flexuosi saepe elongati steriles vel serius florentes. Ochreae maiusculae pallide bruneae caducae. Folia caulina et rameália lanceolata vel late lanceolata, plana, in sicco rigidula tenuiter coriacea, nervis lateralibus angulo 45°–60° a mediano abeuntibus, angustissime scarioso-marginata, basi cuneata, apice longe acuminata, latitudine 3–4-plo longiora, in vel infra medium latissima, petiolo latitudinem folii circiter aequante. Folia superiora sensim minora et angustiora lineari-lanceolata brevius petiolata. Rami inflorescentiae brevissimi, infimi folio suffulti divergentes et paulum remoti, superiores approximati paniculam parvam valde abbreviatam saepe compactam aphyllam formantes. Florum glomeruli omnes approximati aphylli, iam in statu florendi contigui. Perigoniorum fructiferorum pedicelli validiusculi perbreves, perigonio maturo semper breviores, prope basin articulati, in basin perigonii breviter incrassati. Perigonii foliola exteriora lanceolato-linearia, 2–2.5 mm. longa, basibus interiorum appressa. Perigonii folia interiora (valvae) in statu maturo 5–6 mm. longa, 4–5 mm. lata, ovata vel rotundato-triangularia, margine subintegra, apice obtusiuscula vel acutiuscula, facie tenuiter et subaequaliter reticulato-nervosa nervis marginem versus subevanescentibus. Valvae consistentia tenuiter membranacea omnino ecallosae vel unica callum elongatum angustissimum proferens. Nux submatura ad 3 mm. longa, ad 2 mm. lata.

SYNONYMY: *R. ellipticus* Greene, Pittonia 4: 234. 1900; Woot. & Standl. 192. 1915.

DISTRIBUTION: Texas, New Mexico, and Arizona.

TEXAS: Tom Green Co., Knickerbocker Ranch, Dove Creek (*Tweedy* 199, Wa). Near Austin (*Tharp* 1253, Wa). Paloduro Canyon, Canyon City (*Baker* 38, Wa). Low, open ground, Brownwood, Brown Co. (*Palmer* 10376, St). Low, marshy ground and old fields, San Augustine (*Brocket*, Wa; no fr.). Willis, waste places (*Warner*, SL; mixed with *R. Berlandieri*).

NEW MEXICO: Roswell, Chaves Co., fields and ditch banks, common, 1,140 meters (*Earle* 272, Wa, NY, Ke, Be, MW; type). Mangas Valley (*Wooton*, Wa; midrib of the valves somewhat thickened nearly its whole length). Near Lake Arthur (*Wooton*, Wa; see remarks under the preceding).

ARIZONA: Tucson (*Toumey* 343a, Wa; no fr.). Devil's Canyon (*Peebles, Harrison & Kearney* 4432, Wa; see remarks above).

Rumex ellipticus is very nearly related to *R. altissimus* Wood, with which it probably could be united as a subspecies. It differs,

FIG. 7. *Rumex ellipticus* Greene.

however, by the usually shorter and more slender, sometimes procumbent stem, frequently smaller leaves, and, especially, by having the fruiting perigonium without grains. Sometimes one valve shows a midnerve somewhat thickened for nearly its whole length, but not grain-bearing. Perhaps such forms should be considered as intermediates between the two species. The area of *R. ellipticus* covers the most southern part of the area of *R. altissimus*.

Explanation of Figure 7.—Rumex ellipticus Greene, half natural size; New Mexico, *Earle* 272. Valves 4 times natural size, from *Earle* 272.

14. **Rumex Berlandieri** Meisn. nec al. Figure 8

Perennis. Caulis humilis, 40–60 cm. altus, gracilis, adscendens vel suberectus vel flexuosus, bruneus vel purpurascens, tenuiter sulcato-striatus, ochreis albidis membranaceis caducis, initio subsimplex, deinde e nodis mediis vel inferioribus ramos foliosos erecto-patulos serius florentes emittens. Folia caulina ut tota planta glaberrima et levia, in sicco crasse membranacea vel subcoriacea, ambitu linearilanceolata vel oblongo-linearia, inferiora basi rotundata vel subito cuneato-contracta, superiora cuneata apice obtusiuscula margine eroso-crenulata et crispata; nervi secundarii foliorum angulo ± 45° a primario abeuntes. Petiolus foliorum inferiorum crassiusculus, latitudinem laminae superans, superiorum laminae latitudine plerumque brevior. Folia parva, 5–12 cm. longa, latitudine 3.5–5-plo longiora in medio circiter latissima. Florum glomeruli etiam in statu fructifero summis tantum exceptis remoti omnes foliis non suffulti. Rami inflorescentiae primariae singuli simplices, breves, flexuosi, ab axi principali angulo ± 45° abeuntes, leviter arcuato-adscendentes, paniculam parvam apertam formantes. Perigoniorum fructiferorum pedicelli validiusculi deflexi breves, infra medium incrassato-articulati, valvae longitudine plerumque breviores vel eam ad summum aequantes, ad basin perigonii nodoso-incrassati. Perigonii foliola exteriora anguste lanceolata acuta, basibus interiorum adpressa, ca. 2 mm. longa. Perigonii folia interiora (valvae) in statu fructifero 3.5–4.5 mm. longa, 3–4 mm. lata, triangularia vel rotundato-triangularia, apice paulum protracta acuta, consistentia subcoriacea, basi truncata rarius levissime cordata, facie crassiuscule et prominenter reticulato-nervosa, reticulo subaequali, margine integra. Valvae omnes subaequaliter calliferae; callus anguste fusiformis valde prominens ± scrobiculato-rugosus ca. 3 mm. longus, ca. 1 mm. latus. Nux atrofusca, 2.5–3 mm. longa, 1.5–2 mm. lata, vix infra medium latissima.

FIG. 8. *Rumex Berlandieri* Meisn.

SYNONYMY: *R. Berlandieri* Meisn. apud DC. 45. 1856, excl. syn. *R. Romassa*, non Trelease et auct. subsequent. *R. Langloisii* Small, Bull. Torrey Club 23: 405. 1896; Small 370. 1903. *R. floridanus* Trelease, 86. 1892, non Meisn.

ILLUSTRATIONS: Trelease 1892, *pl. 27* (only the habit), *pl. 24* (*R. floridanus*).

DISTRIBUTION: Louisiana, Texas, Mexico.

LOUISIANA: New Orleans (*Drummond* 281, De, Lu; type of *R. Berlandieri* Meisn.; 175, Ke; *Valle*, MW; *Joor*, Ch). Pointe à la Hache, rice fields (*Langlois* 134 or 137, Wa; type of *R. Langloisii* Small). Around Covington (*Langlois* 135, Wa). Gretna, opposite New Orleans, ditches, common (*Ball* 333, Wa). Vicinity of Cameron (*McAtee* 1950, Wa).

TEXAS: San Antonio (*Jermy* 279, G, no fr.; SL). Harris Co., wet prairies near Houston (*Eggert*, SL). Houston, moist borders (*Fisher*, Br., no fr.; Lu; 21, Wa, no fr.; 2068, Wa, no fr.; 3480, MW, no fr.). Wet, sandy ground near Morgan's Point, Harris Co. (*Palmer* 11960, Ca, Br, MW). Willis, waste places (*Warner* 20, SL; mixed with *R. ellipticus*). Evergreen Ranch, Beach (*J. F. Jones*, SL). Port Arthur, prairies (*Kolthoff*, St). Bexar Co. (*Jermy*, NY). Columbia, common on prairie and wet places (*Bush* 1589, NY; 167, SL). Goose Creek (*Fisher* 3453, MW). Galveston (*Lindheimer*, Be). Brazos Santiago (*Nealley* 82, Wa).

MEXICO: Veracruz (*Galeotti* 475, Ke, MW; no fr.). Vicinity of Tampico, Tamaulipas, 15 meters (*Palmer* 12, NY, Wa; no fr.). Michoacán, Loma Santa María, in humidis (*Arsène*, Z; no fr.). De Bejar a la Billo de . . . (*Berlandier* 419, 1699 in 1828, Ke). Without locality (*Berlandier* 115, Be; type of *R. Berlandieri* Meisn.).

I have compared Meisner's and Small's types, and there are no differences between them. Small was misled in creating his *R. Langloisii* by Trelease's wrong interpretation of *R. Berlandieri* Meisn. Most of the plants referred by Trelease to *R. Berlandieri* belong to *R. violascens* Rech. f., an annual or biennial plant without regular axillary branches, with leaves usually broadest above the middle, and much smaller, denticulate perigonia, smaller nutlets, etc. Some collectors have distributed specimens of *R. conglomeratus* and *R. pulcher* under the name *R. Berlandieri*. Trelease's misinterpretation of *R. floridanus* Meisn. has already been corrected by Small, Bull. Torrey Club, loc. cit.

R. Berlandieri is to be compared with *R. mexicanus* Meisn. It is distinguished from the latter by the somewhat dull or yellowish

color when dry, by the short, subobtuse, often crisp leaves of thicker consistency with nervation somewhat prominent on the under side, by the smaller, interrupted panicle with remote whorls, by the different size and outline of the valves with more pronounced, scrobiculate reticulation, and by the different form of the nutlets.

It may be remarked that *R. Berlandieri* is very similar to the cultivated specimen of *R. chrysocarpus* Moris, Enum. Sem. Hort. Bot. Taurin. anni 1831; Mem. Reale Acad. Sci. Torino 38: 46. 1835, which I mentioned in Vorarbeiten 3: 27. That is possibly the earlier name for Meisner's plant. Moris notes Chile as the country of origin, but Meisner apud DC. 46. 1856, states: "Patria ignota, verisimiliter Mexico aut Chili." As I have not seen a spontaneous specimen of *R. chrysocarpus* from Chile in any herbarium, it seems probable that it is native to Mexico rather than Chile. Yet as long as I am unable to place definitely the type of *R. chrysocarpus*, it seems preferable to retain the name *R. Berlandieri* for the North American plant.

Explanation of Figure 8.—*Rumex Berlandieri* Meisn., half natural size, Texas, *Jermy*. Valves 4 times natural size, from *McAtee* 1950.

15. **Rumex mexicanus** Meisn. Figure 9, *a*

Perennis. Caules complures plerumque validi rarius graciles arcuato-ascendentes vel erecti, subflexuosi vel stricti, brunei vel purpureo-suffusi, ± profunde sulcato-striati, glabri laeves, 30–90 cm. alti, a basi ex axillis foliorum ramos foliosos serius elongatos et floriferos interdum iterum ramosos proferentes. Ochreae pallide bruneae vel albidae hyalinae caducae. Folia omnia consistentia in sicco rigide papyracea, colore pallide viridi, utrinque glabra et levia. Folia caulina inferiora lineari-lanceolata plana vel leviter undata, latitudine 5–7-plo longiora, basi brevius apice longius angustata. Nervi secundarii foliorum tenues, angulo ± 45° a primario abeuntes. Petioli foliorum latitudinem laminae ± aequantes. Folia caulina superiora foliaque ramorum axillariorum angustiora et brevius petiolata. Rami inflorescentiae singuli simplices vel infimi interdum ramosi et saepe elongati, omnes validi rigidiusculi omnes ± stricte erecti vel angulo acuto ± arcuato-divergentes, paniculam ± apertam sed florum glomerulis plurimis approximatis densiusculam formantes. Rami infimi tantum folio suffulti. Perigoniorum fructiferorum pedicelli validiusculi, prope basin distincte incrassato-articulati, in basin perigonii subinflato-dilatati perigonio maturo plerumque breviores. Perigonii foliola exteriora ca. 2 mm. longa.

Perigonii folia interiora (valvae) in statu maturo 4–5 mm. longa, 3.7–4 mm. lata, ambitu late triangularia, angulis basalibus subdilatatis rotundatis, consistentia rigide membranacea subcoriacea, colore obscure vel olivaceo-bruneo, basi truncata vel subcordata, apice obtusiuscula vel acutiuscula, margine integra vel saepius imprimis basin versus minutissime et irregulariter crenulata vel erosula, facie regulariter elevate reticulato-nervosa, nervatura in utroque latere calli tres usque quattuor maculas lata. Valvae omnes subaequaliter calliferae; callus anguste fusiformis valde prominens, basi rotundatus, apice acutus 2.5–3 mm. longus, ad summum 1 mm. latus, valvae latitudine semper multo angustior, saepe leviter scrobiculato-rugosus. Nux atrofusca fere nigra ± 2.5 mm. longa, 1.7 mm. lata, infra medium latissima, basi breviter, apice sublongius acuminata.

SYNONYMY: *R. mexicanus* Meisn. apud DC. 45. 1856.

DISTRIBUTION: Mexico and New Mexico.

NEW MEXICO: Las Cruces, Dona Ana Co., 1,170 meters (*Wooton* 79, SL). Magdalena (*Herrick* 611, Wa). Navajo Indian Reservation, Shiprock Agency, 1,425 meters (*Standley* 7196, Wa).

MEXICO: Chihuahua (*Stearns* 19, Ch). Chihuahua, near Colonia García in the Sierra Madre, 2,280 meters (*Townsend & Barber* 261, Wa, Ca, Z, UW, Be, St). Durango and vicinity (*Palmer* 17, Wa; Ca, no fr.; Ke; Be, no fr.). Vicinity of Morelia, Michoacán, jardin du St. Coeur, 1,950 meters (*Arsène* 3335, Wa, NY, St, G, Ke; all of slender habit). Morelia, lieux marécageux (*Arsène* 7878, MW). Region of San Luis Potosí, 1,800–2,400 meters (*Parry & Palmer* 794, Ke; no fr.). San Luis Potosí, in paludosis ca. urbem (*Schaffner* 904, 906, Ke). Bord de l'Atoyac, près de Puebla (*Nicolás*, Wa, Ke; no fr.). Vicinity of Puebla, Rancho Posada, Puebla (*Arsène* 87, Wa, Mu; no fr.). Vicinity of Puebla, près du Cimetière, 2,170 meters (*Arsène* 2225, Wa, H; slender habit). Near Plateado, Zacatecas (*Rose* 2787, Wa, NY). Federal District, wet soil, Valley of Mexico, 2,190 meters (*Pringle* 6716, Ca, Wa, St, Be, H, Mu, Le, MW, UW; 9487, Wa, Z). Hidalgo, Sierra de Pachuca (*Rose & Hay* 6243, Wa; no fr.). Desierto de los Leones (*Ruttem* 277, Ut; no fr.). In arvis prope León (*Pl. Hartweg.* 1619, Lu; no fr.). Sonora Alta (*Coulter* 1388, Ke). Amecameca, 2,430 meters (*Fisher* 241, Ch, Wa). Contadero (*Lyonnet* 529, Wa). Chinantla (*Liebmann* 699g, Ko; without grains). Mineral del Monte, Hidalgo (*Ehrenberg* 41; type of *R. mexicanus* Meisn.). Parras (*Orcutt* 3801, Ch, Wa). Mt. Orizaba (*Seaton* 270, Wa). Toluca and vicinity (*Wawra* 1190, WM). San

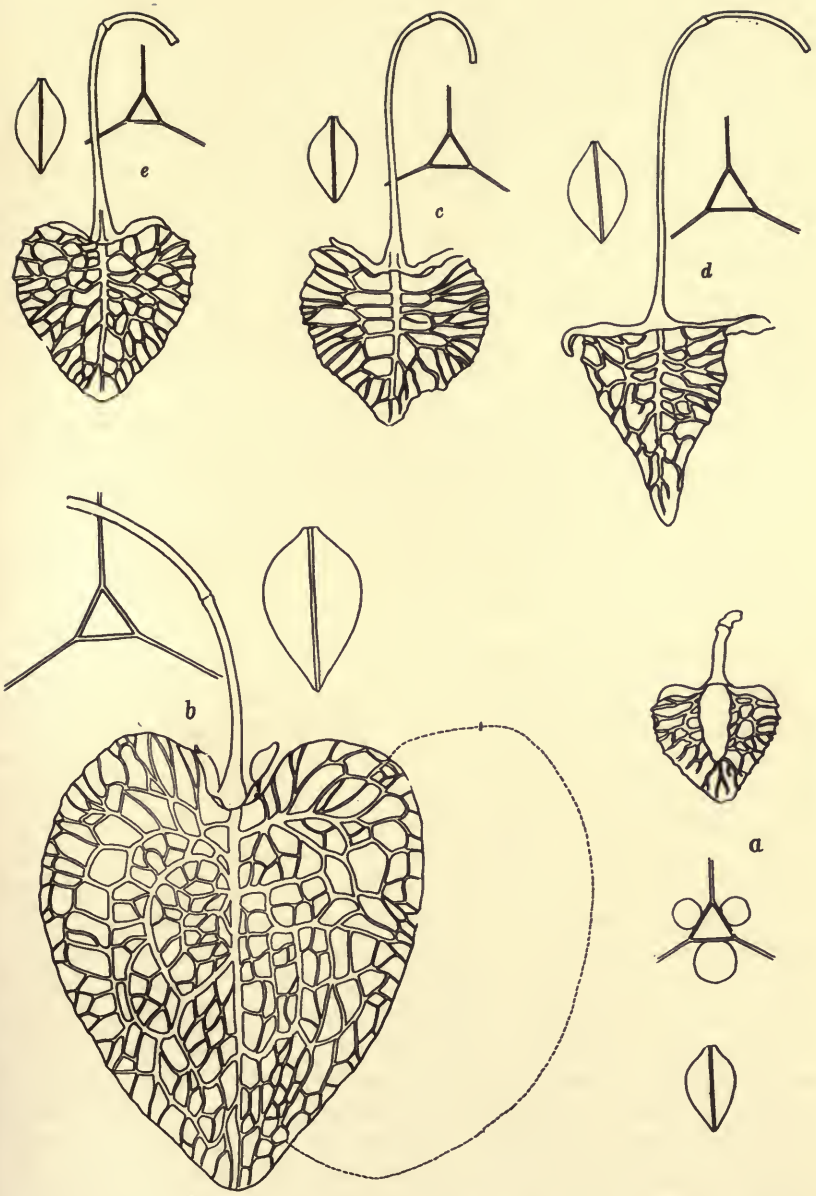

FIG. 9. Valves of (a) *Rumex mexicanus* Meisn., (b) *R. hymenosepalus* Torr., (c) *R. densiflorus* Osterh., (d) *R. pycnanthus* Rech. f., (e) *R. occidentalis* Wats.

Esteban Tacubaya, D. F. (*L. G. Ruiz* 19, Ch, Wa; no fr.). "Tierra fría" (*Schiede* 90, Be, type of *R. mexicanus* Meisn.; Lu). Without locality (*Schmitz* 284, MW; *Schaffner*, Be, no fr.; Ke).

The name *R. mexicanus* is used here in the original, that is to say, in the strict, sense of Meisner. Fernald in Rhodora 10: 17. 1908, used it in a more ample sense, including all the plants placed here under *R. triangulivalvis*. The two species are, of course, nearly related. The differences are relative and lie in the size of the fruiting perigonia and the nutlets. The reason that I have not united this to the type as a subspecies of *R. mexicanus* is rather a practical one. American botanists and especially geobotanists may appreciate having a simple binary name for the common "white dock." See also under *R. triangulivalvis*.

R. mexicanus has partly the same area as *R. Berlandieri* Meisn., but does not extend so far north and east. As to the differences between these two species, see under *R. Berlandieri*; between *R. mexicanus* and *R. altissimus* Wood, see under the latter.

Explanation of Figure 9, a.—Rumex mexicanus Meisn., valves 4 times natural size, Mexico, *Schiede*.

16. **Rumex triangulivalvis** (Danser) Rech. f. Figure 10

Perennis. Caulis singulus vel plures, primum ± stricte erectus panicula excepta subsimplex, deinde elongatus flexuosus interdum decumbens ex axillis foliorum ramos foliosos paniculas serius florentes gerentes emittens. Caulis et rami ± leviter sulcato-striati glabri laeves pallide brunei vel aurantiaco-brunei vel purpurascentes, 40–100 cm. alti. Ochreae albidae vel pallide bruneae ca. 2 cm. longae caducae. Folia caulina omnia consistentia in sicco rigide papyracea colore pallide viridi plana rarius subundulata. Folia caulina inferiora lineari-lanceolata, latitudine ± 5-plo longiora, 12–15 cm. longa, basi breviter, apice longius angustata. Nervi secundarii a mediano angulo ± 45° abeuntes. Petiolus foliorum latitudine laminae plerumque brevior. Folia caulina superiora et folia ramorum sensim angustiora latitudine ± 7-plo longiora, brevius petiolata, summa subsessilia. Rami inflorescentiae singuli simplices infimi tantum interdum iterum ramosi subelongati omnes tenues flexuosi angulo 30°–40° subarcuato-patentes paniculam sat parvam apertam formantes; florum glomeruli infimis interdum exceptis approximati. Rami inflorescentiae infimi tantum folio suffulti. Perigoniorum fructiferorum pedicelli tenues, prope basin distincte incrassato-articulati, in basin perigonii subito dilatati, perigonio maturo plerumque

FIG. 10. *Rumex triangulivalvis* (Dans.) Rech. f.

breviores ad summum eo 1.5-plo longiores. Perigonii foliola exteriora 1.6–1.8 mm. longa. Perigonii folia interiora (valvae) in statu fructifero (1–) 3 (–4) mm. longa, 2.5–3 mm. lata, consistentia rigide membranacea, colore pallide bruneo, ambitu triangularia, angulis basalibus rotundatis, basi subcordata vel truncata, apice acutiuscula, margine integra vel saepius basin versus minute irregulariter crenulata, facie subregulariter elevate reticulato-nervosa reticulo nervaturae in utroque latere calli 2–3 maculas lato. Valvae plerumque omnes subaequaliter calliferae raro 1–2 calli evanescentes (f. *unigranis* [Dans.] Rech. f.) vel deficientes; callus anguste fusiformis prominens, basi rotundatus apice acutus, 1.8–2.5 mm. longus, 0.6–0.9 mm. latus, valvae latitudine semper multo angustior, saepe leviter scrobiculato-rugosus. Nux 2 mm. longa, ± 1.3 mm. lata, atrofusca fere nigra, infra medium latissima, basi breviter apice sublongius acuminata.

SYNONYMY: *R. triangulivalvis* Rech. f. Repert. Sp. Nov. 40: 297, 1936. *R. salicifolius* Weinm. subsp. *triangulivalvis* Danser, Nederl. Kruidk. Archief 415. 1925 (appeared in 1926). *R. salicifolius* auctorum multorum, non Weinm. *R. mexicanus* Fernald, Rhodora 10: 119. 1908, non Meisn. *R. Acetosella* × *salicifolius* Svend Andersen, Bot. Tidsskrift 43: 52. 1934. *R. crispus* × *salicifolius* Svend Andersen, loc. cit.

ILLUSTRATIONS: Danser, loc. cit; Trelease 1892, *pl. 26* (*R. salicifolius*); Britt. & Brown 549. 1896 (*R. salicifolius*).

QUEBEC: Labrador, Saguenay Co., sandy shore, Romaine, Lorgondière (*St. John* 90400, O). Environs de Montréal, Longueuil, chemin de Boucheville (*Marie-Victorin* 25029, St). Environs de Montréal, Boucheville, Ile Charron (*Marie-Victorin* 27225, St; no fr.). Grèves de St. Laurent de l'Ile d'Orléans (*Marie-Victorin* 15769 bis, Lu; no fr.). Vicinity of Ottawa, Deschênes (*Rolland*, Ch, Wa).

ONTARIO: Ottawa (*Macoun* 5379, Ch; 5878, O; *Harrington* 356–8, O). Timmins (*Ostenfeld* 261, Ko). Grant Point, Nipigon Lake (*Pulling*, O; no fr.). English River (*Richardson* 23758, O). Moose Factory, James Bay (?, 62613, O; no fr.).

MANITOBA: Selkirk (*Macoun* 23752, O; no fr.). In ditches and boggy places, Brandon (*Macoun* 12916, O). Winnipeg (*Magnus*, H).

SASKATCHEWAN: Damp places, Cypress Hills (*Macoun* 5880, O; 1533, Wa). By a dry pool, Moose Jaw (*Macoun* 12855, O; no fr.). South of Wood Mountain (*Dawson* 78763, O). Lake Manitou, along the line of Grand Trunk Railway (*Macoun & Herriot* 76815, O). Moose Mt. Creek (*Macoun* 23751, O; no fr.). South of Battle-

ford, borders of salt marshes (*Macoun* 23753, O). Without locality (*Bourgeau*, MW, St).

ALBERTA: At camp in Crook Flat, sage bank (*Macoun* 12917, O). Boggy ground, Bow River, Calgary (*Moodie*, Wa; no fr.). Craigmyle (*Brinkman* 868, Ch).

BRITISH COLUMBIA: Near marshes, Nelson (*Macoun* 23748, O). Sumas Lake (*Macoun* 54770, O). Wet places, Trial (*Macoun* 67976, O). Saline soil, Kamloops (*Macoun* 23759, O). Billy River (*Dawson* 114109, O). Saline soil, Garnetts Ranch, Old Mans River (*Dawson* 23750, O). Crow Nest Pass (*Macoun* 24678, O). District of Renfrew (*Rosendahl* 763, O).

MAINE: On wharf, Bangor (*Knight*, St).

MASSACHUSETTS: A single large clump in waste ground by railroad, Southbridge (*Weatherby*, Wa).

NEW YORK: Orient Point, Suffolk Co. (*Latham*, NY; no fr.).

OHIO: Without locality (*Frank* in 1837, H, Z).

MICHIGAN: Along railroad near Port Huron (*Dodge*, Wa). Keweenaw Co. (*Farwell*, Ch).

WISCONSIN: Shore between Point Sable and Red Banks, Brown Co. (*Schuette* 104, Ca).

MINNESOTA: Twin Lakes, Dakota Co. (*Mearns* 827, Wa).

MISSOURI: St. Louis (*Engelmann*, Be; no fr.).

NORTH DAKOTA: Leeds, Benson Co. (*Lunell*, NY). Benson Co., Butte (*Lunell*, St). Dickinson (*Holgate*, Wa).

SOUTH DAKOTA: Brookings (*Thornber*, Ca). Aberdeen (*Griffith*, Be; no fr.). Vicinity of Redfield, Spink Co., swampy, saline ground (*Ricksecker* 91, Ca; leaves only).

MONTANA: Westby (*E. L. Larsen* 152, SL). Vicinity of Glacier Park Station, alt. 1,440–1,530 meters, low prairie (*Standley* 17772, Wa). Helena (*Kelsey*, Ca; no fr.). Great Falls (?, Ca; no fr.).

WYOMING: Yellowstone Park (*Hawkins* 452e, Wa; no fr.). Yellowstone Falls, near Canyon Hotel (*Mearns* 4248, Ko). Yellowstone National Park, Snake River, margins of ponds (*A. & E. Nelson* 6436, SL). Yellowstone National Park, roadside at Petrified Tree (*H. S. Conard* 1479, MW). Swan Lake Valley, 2,400 meters (*Knowlton*, Up). Laramie (*A. Nelson* 1449, SL). Encampment, river bottom, 2,160 meters (*Tweedy* 4390, Wa). Medicine Bow Mts. (*Mann* 150, La). Rolling plains between Sheridan and Buffalo, 1,160–1,660 meters (*Tweedy* 3269, P; 3276, La).

COLORADO: Plains near Denver, 1,550 meters (*T. Holm*, Ch, SL). Denver (*Eastwood* 127, Ke). Routt Co. (*Trelease*, UW). Steamboat Springs (*Goodding* 1609, Ca). Estes Park, 2,300–2,660 meters (*J. W. Burton*, SL). Larimer Co. (*C. S. Crandall*, SL). Near La Plata, along roadsides (*Baker, Earle & Tracy* 529, MW, SL; no fr.). Region of Gunnison Watershed (*Baker* 652, SL, UW). Brighton (*Johnston* 499, SL). Cornish (*Johnston* 222, La). Leadville (*Schedin* 423, La).

NEW MEXICO: College Farm, Mesilla Park (*P. C. Standley*, Wa, SL; appr. *or.*). Santa Fe, 2,160 meters (*A. A. & E. G. Heller* 3745, SL; *or.*). Santa Fe, along ditch (*Fendler*, SL; no fr.). Patterson (*Wooton*, Wa). Rio San Jose (*H. H. Rusby*, SL). Sandbars, Navajo Indian Reservation, vicinity of Shiprock Agency, 1,425 meters (*Standley* 7878, Wa; appr. *or.*). Along creek, Brazos Canyon, Rio Arriba Co. (*Standley & Bollman* 11128, Wa; appr. *or.*). Open slope, vicinity of Chama, Rio Arriba Co., 2,380 meters (*Standley* 6607, Wa; *or.;* no fr.). Chama (*Baker* 298, SL). Gila (*Wooton*, Lu; no fr.). Las Cruces, Dona Ana Co., 1,170 meters (*Wooton* 79, Ca, UW; appr. *or.*). Mesilla Valley, Dona Ana Co. (*Wooton & Standley* 3275, P).

WASHINGTON: Grant Co., moist meadow, Grand Coulee (*Thompson* 9138, SL; *or.*). Pullman (*Piper*, P). Glacier Basin Trail, 1,500 meters. Mt. Rainier (*Jones*, P). Grand Coulee, Grant Co. (*St. John* 7672, P). Wilson Creek, Douglas Co. (*Sandberg & Leiberg* 329, P; *Lake & Hull* 651, P; both specimens with valves narrower and more pointed).

OREGON: Shore of Klamath Lake, near Modoc Point (*Coville* 1335, Wa; *or.*). East side of Klamath marsh (*Coville* 1247, Wa; *or.*). Near Fort Klamath, 1,410 meters (*Leiberg*, SL; *or.*). Eastern Grant Co., small, dried pond, Austin (*Henderson* 5651, SL; *or.*). Along ditches, Redmond (*Whited* 102, Ke; *or.*). Cache Bar, between Cache and Garden creeks on Snake River, 380 meters (*E. P. Sheldon* 8338, SL; *or.*). Crooked River, Smith Rock, Deschutes Co. (*Whited* 415, P; not typical). Margin of Strawberry Lake, Blue Mts., Grant Co. (*Cusick* 3621; not typical). Sauvies Island (*Howell*, P; valves narrower and more pointed). Hayden Island (*Gorman* 4204, P). Without locality (*Elihu Hall* 441, SL; *or.*).

IDAHO: Near stream at Mullan, 950 meters (*Leiberg* 1489, Ca, SL). Benton Co., Priest River, 810 meters (*C. C. Epling*, SL). Sandy shores, Lake Pend Oreille (*Leiberg* 110a, SL).

NEVADA: L—— River Crossing (*Griffiths & Morris* 121, Wa; *or.*).

UTAH: Fairview, 1,950 meters (*Jones* 5554i, Wa; *or.*). Morgan Co. (*Garrett* 6327, MW; *or.*). Juab, creek bottoms (*Goodding* 1072, SL; *or.*). Soldiers Summit (*Jones*, Ca; *or.;* no fr.). Kyune, 1,800 meters, in gravel (*Jones* 56031, SL; *or.*). Snyderville, Summit Co. (*Garrett* 6779, Ch; *or.*). Dry Lake, Cache Co. (*Garrett* 6479, Ch; *or.*).

ARIZONA: Bellemont (*Jones* 4075, Ca). Fort Valley, 2,175 meters, Coconino National Forest and vicinity (*Pearson* 214, Wa; appr. *or.*). Williams (*Greene*, Ch). Walnut Canyon, 1,500 meters (*Leiberg* 5781, Wa). Grand Canyon (*Millspaugh* 134, Ch).

CALIFORNIA: Butte Co., meadows at Butte, in the Canadian Zone (*Heller* 14072, Wa; *or.*). Alpine Co., Carson Spur, 2,550 meters (*Hansen* 752, Ca; *or.;* no fr.). Alpine Co., Kirkwood, 2,550 meters (*Hansen* 752, SL, UW; *or.;* no fr.).

SWEDEN: Göteborg: Gullbergsgärde (*Ohlsén* in 1925 and 1926, St; no fr.). Skåne: Malmö (*Blom*, St; *Holmberg*, Br). Kristianstad (*Blom*, St; *Lange*, St; no fr.). Ystad, ad portum (*Sandberg*, Br). Landskrona (*Nilsson*, St). Södermanland: Nacka, Hästholmen near "Tre Kronor" Mill (*Vestergren*, St). Nacka, "Svetsjo" Mill (*Laurent*). Småland: Kalmar (*Anderson*, St, De, O). Kalmar, harbor (*Trolander*, St). Ruda, railway station (*O. Köhler*, St, Br, De). Stockholm: Hästholmen (*Haegerstolpe*, St). Saltsjöqvarn (*Segerström*, St). Hammerbysjö (*Uggla*, St). Hortus Bergianus, not cult. (*Scoggren*, St). Bohuslän: Marstrand, harbor (*Blom*, St; no fr.). Västmanland, Västerås, vicinity of the harbor (*Ohlin*, St).

NORWAY: V. Aker, Storo (*Holmboe*, St; no fr.).

DENMARK: Fynen: Nyborge, harbor (*Andersen*, Ko; no fr.). Svendborg (*Andersen* 32, Ko). Andens(?), harbor (*Wiinstedt*, Ko). Jytland: Vejle Havn (*Andersen*, Ko). Horsens Havn (*Andersen* 24, Ko). Esbjeds(?) (*Andersen*, Ko). Sjaelland: Farun (*Andersen*, Ko). Aalborg, Spritfabrik (*Andersen*, cotypes of *R. crispus* × *salicifolius* and *R. Acetosella* × *salicifolius*). Kjöbenhavn, Frihavn (*Andersen*, Ko). Kjöbenhavn, Sydhavn (*Plenge* [?], Ko). Kjöbenhavn, Botanic Garden (*J. S. Wm.*, St). Amager, by Island Bridge (*Wiinstedt*, Ko).

NETHERLANDS: Schiedam (*W. D. C. Kooper*, Ut). Ooi (*W. D. C. Kooper*, Z, Ut). Zeist (*van Stenis*, Ut). Rotterdam (*Jansen & Wachter* 24567, 24584, 24585, 24587, hb. Leiden; determined as *R. salicifolius* subsp. *triangulivalvis* by Danser).

SWITZERLAND: Fosses de la campagne Prevost, bord de l'Arve, Genève (*L. Naville*, De).

GERMANY: Bavaria, München (*Harz*, Br, MW).

LETTLAND: Prov. Zemgale, Kr. Ilkuste, Demene, railway station (*Starcs*, Hb. Starcs).

This is the plant to which the name *R. mexicanus* Meisn. was applied in a more ample sense by Fernald, Rhodora 10: 19. 1908. *R. triangulivalvis* differs from *R. mexicanus* by the smaller size of valves and nutlets. The measurements given in the above description are the average obtained from a large number of specimens examined. Since such small-fruiting individuals never occur in Mexico as in the far North, I believe that the two types deserve recognition. At most they may be united as subspecies under *R. mexicanus;* see the general discussion of the *Salicifolii*, p. 12, and the discussions of *R. mexicanus* and *R. utahensis*. *R. triangulivalvis* is the only species of subsect. *Salicifolii* that occurs rather frequently introduced in Europe.

In the mountainous western parts of the United States is a form differing in some respects from the type:

Var. **oreolapathum** Rech. f.—Differt a typo caule minus elato, 20–40 cm. tantum alto, saepe crassiore, interdum profundius sulcato, ramis inflorescentiae brevioribus, inflorescentia in statu fructifero compacta, foliis minoribus saepe proportione latioribus, valvis et nucibus minoribus.—The specimens belonging to this variety are indicated in the list of specimens examined by an added "*or.*"

Not all the characters mentioned above are always to be observed together, but the tendency to develop forms showing several characters is generally obvious in the Rocky Mountains from New Mexico to Idaho.

In connection with *R. triangulivalvis* it is necessary to discuss certain critical forms which probably are nearly related to it. On account of the lack of illustrative material, I can not give any judgment on their systematic position.

(1) *R. hesperius* Greene, Pittonia 4: 234. 1899–1901; Piper 225. 1906; Rydb. R. 231. 1922.—Type locality: Bottom lands near Bingen, Washington (*Suksdorf* 2259, Ca, P; photo. of type from Greene Herbarium, MW). Stems and axillary branches slender, curved; leaves (dried) relatively thin, lanceolate, about 5 times as long as broad, narrowed to each end, the lateral nerves forming an angle of 45° with the midrib; branches of the panicle slender, strongly curved, spreading; valves triangular, the sides of nearly equal length, to 4 mm. long and wide, entire, only one with a relatively small and

narrow grain (not without grains as the author states, in error!). Among the *Rumex* material lent from Pullman, Washington, were no further specimens that agreed with Greene's type. In the New York herbarium, I saw a specimen without fruits, collected by Suksdorf at the original locality, named *R. hesperius*, with much narrower, nearly linear-lanceolate leaves; only further observation of living plants will decide whether it is a mere modification or a distinct species or a variety of *R. triangulivalvis*.

(2) Unfortunately I failed to see the type of *R. mexicanus* Meisn. var. *strictus* Peck, Proc. Biol. Soc. Wash. 47: 185. 1934, described by the author as follows: "Erectus gracillimus strictusque ramis arcte ascendentibus; foliis lineari-lanceolatis vel anguste oblongo-lanceolatis ad petiolos gradatim contractis; inflorescentia angusta ramis arcte ascendentibus; segmentis interioribus perianthii anguste ovatis minime deltoideis. Type, *Peck* 13924, in a wet meadow 8 mi. south of Burns, Harney Co., June 24, 1925. A very narrow-leaved, slender, and strict form, quite unlike the typical plant." Type in herbarium of Willamette University, Oregon. At present I can not decide whether it is a distinct unit or perhaps a variety of *R. triangulivalvis* or of another related species. I have seen specimens that seem to agree more or less with the description of var. *strictus:* California: Sierra Nevada, Salmon Creek, Tulare Co., meadow (*Hall & Babcock* 5166, Ca).—Arizona: Fort Whipple (*Coues & Palmer*, SL).—Wyoming: Danee(?) (*Pammel* 14, SL).—Nevada: White Mts., Trail Canyon, 3,000 meters, in and around springs and slowly flowing streams (*Duran* 3351, P).

(3) In the state of Washington—for instance, Wilson Creek, Douglas Co. (*Sandberg & Leiberg* 329, Ko, Up, Ca; *Lake & Hull* 651, SL)—occurs a form which is remarkably distinguished from *R. triangulivalvis* by its narrow and consequently more pointed valves, scarcely 3 mm. long and 2 mm. broad. All valves show narrow grains, nearly equal in size. The pedicels are often somewhat longer (to 1.5 times the fruit length) than those of the typical *R. triangulivalvis*. The branches of the fruiting panicle are divergent-ascending, that is, bowed, the lower whorls often somewhat remote.

Explanation of Figure 10.—Rumex triangulivalvis (Dans.) Rech. f., half natural size, Butte, North Dakota, *Lunell.*

17. **Rumex lacustris** Greene. Figure 11

Perennis. Caulis 50–90 cm. altus, tenuiter sulcato-striatus purpureo-violaceo suffusus aut (f. *aquatilis* Rech. f.) ad ½–⅔ longitudinis

simplex stricte erectus fistulosus submersus, internodiis inferioribus valde elongatis, nodis inferioribus aphyllis radiculas adventivas tantum gerentibus, parte superiore brunnescens flexuosus sparse foliosus ramosus rami tenues flexuosi foliosi divergentes inflorescentiis parvis ± contractis terminati—aut (f. *terrestris* Rech. f.) caules complures tenues decumbentes vel ascendentes, 20–40 cm. alti, a basi crebre ramosi ± papillosi. Ochreae albido-brunnescentes evanescentes. Folia consistentia in vivo verosimiliter subcarnosa, in sicco subcoriacea, colore in sicco olivaceo, ambitu oblongo- vel ovato-lanceolata, basi cuneata, apice saepe abrupte rotundato-acuminata, nervis secundariis vix conspicuis angulo ca. 45° abeuntibus. Folia margine minute crenulato-crispula imprimis in formis terrestribus subtus sub lente primum minutissime papilloso-puberula, deinde interdum glabrescentia. Petioli latitudinem foliorum inferiorum saepe multo superantes. Folia caulina superiora ad 7 cm. longa, ad summum 2 cm. lata, in medio circiter latissima. Folia ramealia proportione minora et angustiora, summa sensim angustata. Rami inflorescentiarum breves tenues singuli simplices arcuato-flexuosi paulum divergentes, infimi tantum folio suffulti. Florum glomeruli infimi remoti, ceteres contigui, omnes foliis suffulcrantibus carentes. Perigoniorum fructiferorum pedicelli tenues breves, perigonio saepius breviores vel ad summum aequilongi, infra medium insensibiliter articulati, in basin perigonii infundibuliformi-dilatati. Perigonii foliola exteriora lanceolata acuta ad 1.3 mm. longa. Perigonii folia interiora (valvae) in statu maturo 2.1–2.5 mm. longa, ca. 1.5 mm. lata, ambitu ovato-linguiforma, basi angustato-rotundata, apice acuta, margine integra, consistentia membranacea, colore pallide brunea, facie tenuiter elevate reticulato-nervosa. Valvae omnes subaequaliter calliferae. Calli fusiformes duriusculi in nervum medianum valvae sensim angustati, tenuissime rugulosi vel sublaeves, 1.5–2 mm. longi, 0.5–0.6 mm. crassi. Nux matura atrofusca 2–2.2 mm. longa, 1–1.1 mm. lata, basi brevius, apice longius acuminata.

SYNONYMY: *R. lacustris* Greene, Erythea 3: 63. 1895.

DISTRIBUTION: Oregon, California.

OREGON: Shirk, 1,500 meters (*Leiberg* 2589, Wa, Ca, Be; *terr.*). Swan Lake Valley, Klamath Co. (*Applegate* 472, Wa, G; *aqu.;* no fr.). Stein's Mountain (*Howell* 535, UW; 909, Ch; *terr.;* no fr.). In dry ponds, Barren Valley (*Cusick* 1960, P, Ca, SL; *terr.*). Moist ground, north end of Summer Lake, Lake Co. (*Peck* 15698, SL; *terr.*). Shore of Goose Lake (*Austin & Bruce* 2294, Ca; *terr.*).

FIG. 11. *Rumex lacustris* Greene.

CALIFORNIA: Silver Lake, Lassen Co. (*Baker & Nutting*, MW; photo. of type, Hb. Greene).

This species is well characterized by its extremely small fruiting perigonia. It occurs in two ecologic types, terrestrial and aquatic, quite analogous to *Polygonum amphibium* L. This fact has been unknown till now, and this high degree of capability of accommodation to changing level or complete lack of water is unique in the genus *Rumex*. Greene has described a form of the aquatic state with tall, fistulous stems, straight upright and submerged for half or two-thirds their height. The lower and middle leaves are not developed in this case; instead of the leaves, tender adventive rootlets arise from the lower nodes. The upper leaves are emersed and somewhat pubescent, at least on the under side. But there exists also an entirely submerged form, as represented by *Applegate* 472, with large, entirely glabrous leaves. The terrestrial state is either broad- or narrow-leaved, and the leaves are pubescent usually on both sides. This is the single case of pubescence in Subsect. *Salicifolii*. The area of this interesting species is strictly limited to Oregon and California.

Explanation of Figure 11.—Rumex lacustris Greene, half natural size: (*a*) f. *terrestris* Rech. f., Oregon, *Cusick* 1960; (*b*) f. *aquatilis* Rech. f., Oregon, *Applegate* 472. Valves 4 times natural size, from *Cusick* 1960.

18. **Rumex transitorius** Rech. f. Figure 12

Perennis. Caules singuli vel saepius plures, validi arcuato-ascendentes vel suberecti, flexuosi, brunnescentes vel purpureo-suffusi, profunde sulcato-striati glabri laeves, 25–60 cm. alti, a basi in axillis foliorum ramos foliosos serius elongatos floriferos saepe iterum ramosos proferentes. Ochreae pallidae bruneae evanescentes. Folia omnia consistentia in sicco crasse membranacea, colore sordide viridi, utrinque glabra et laevia. Folia caulina inferiora lanceolata, 6–12 cm. longa, 2–2.5 cm. lata, plana, latitudine 3.5–6-plo longiora, in medio circiter vel paulum infra latissima, basi brevius, apice longius angustata. Nervi secundarii foliorum tenues, angulo ± 45° a primario abeuntes. Petioli laminae latitudinem circiter aequantes. Folia caulina superiora foliaque ramorum axillariorum angustiora et brevius petiolata. Rami inflorescentiae singuli, inferiores ramosi, superiores simplices, omnes sat validi, inferiores plerumque angulo 50°–90° subarcuato-patentes, superiores erecto-patentes paniculam apertam florum glomerulis approximatis densiusculam formantes, rami infimi tantum folio suffulti. Perigoniorum fructiferorum

FIG. 12. *Rumex transitorius* Rech. f.

pedicelli filiformes validiusculi perigonio maturo aequilongi vel eo 1.5 (–2) -plo longiores, in quarta circiter parte inferiore distincte incrassato-articulati, in basin perigonii abrupte incrassato-dilatati. Perigonii foliola exteriora ± 1.6 mm. longa anguste lanceolata acuta. Perigonii folia interiora (valvae) in statu maturo 2.5–3 mm. longa, 2–2.3 mm. lata, ambitu ovata vel ovato-lanceolata, consistentia rigide membranacea, colore sordide aurantiaco vel atro-bruneo, basi rotundata, apice acuta, margine integerrima vel sub-integra, facie irregulariter interdum obsolete reticulato-nervosa reticulo in utroque latere mediani ad summum 2 maculas lato. Valva unica (var. *monotylos* Rech. f.) vel saepius omnes callum ovatum crassum prominentem basi rotundatum apice acutum ad 2 mm. longum ad 1.5 mm. crassum magnam partem valvae abscondentem ferentes; calli plerumque sublaeves. Nux atrofusca ca. 2 mm. longa, ca. 1.3 mm. lata, vix infra medium latissima, basi brevius, apice longius acuminata.

SYNONYMY: *R. transitorius* Rech. f. Repert. Sp. Nov. 40: 296. 1936. *R. salicifolius* auct. Americae borealis p.p., non Weinm.

DISTRIBUTION: Pacific United States and Vancouver Island.

BRITISH COLUMBIA: Vancouver Island, Sidney (*Macoun* 87914, O). Nanaimo (*Macoun* 1563, 83928, O). Salt marshes, Departure Bay (*Macoun* 23756, O).

WASHINGTON: Seattle, common along coast, common in moist places (*Freiberg*, SL; *E. M. Bardell*, SL). Walla Walla (*Savage, Cameron & Lenocker*, SL; approx. var. *monotylos*). Friday Harbor (*Peck* 13005, P). San Juan Island (*Reynolds*, Ch).

OREGON: Garibaldi (*Hitchcock*, 12361, Wa; no fr.). Linn Co., near Tangent (*E. E. Stanford* 1645, SL; var. *monotylos?;* no ripe fr.). Sand north of Forestry Building, Portland (*Thompson* 3717, Ke; var. *monotylos*). Corvallis, streets (*Cole & Fleischmann*, SL, Wa; var. *monotylos*).

CALIFORNIA: Samoa, Humboldt Co. (*H. H. Smith* 3866, Wa). Humboldt Co., vicinity of Eureka, waste places, not abundant, 0–150 meters (*Tracy* 1157, Ca). Butte Co., in low field along Butte Creek between Durham and Nelson, in open, treeless valley, growing with *Lasthenia, Deschampsia, Navarretia, Psilocarpus,* and *Boisduvallia,* 52 meters, widely distributed over the western half of the county (*Heller* 11396, Ca). Vicinity of Berkeley (*Walker* 172, La, Ca; *Greene,* Ca, var. *monotylos; Davy,* La). Santa Clara Co., Santa Cruz Peninsula, north embankment of Lake Lagunita, Stanford University (*Dudley,* SL, Br).

Under the name *R. transitorius* I include all the Pacific *salicifolius*-like forms with perigonium segments covered for the larger part, but never entirely, by the large grains. The leaves are often rather short and the branches of the panicle are curved-spreading. The rather rare var. *monotylos* sometimes is similar to the genuine *R. salicifolius* Weinm., but has larger fruits. Some of the 3-grained forms are similar to *R. pallidus* Bigel., but they are distinguished from that species by shorter, more globular, and rather smooth grains.

Explanation of Figure 12.—Rumex transitorius Rech. f., half natural size; California, *Tracy* 1157. Valves 4 times natural size, California, *Dudley* in 1897.

19. **Rumex pallidus** Bigel. Figure 13

Perennis. Caules complures tenues graciles procumbentes vel arcuato-ascendentes flexuosi, pallide virescentes vel brunnescentes vel purpureo-suffusi, tenuiter sulcato-striati, glabri laeves, 30–70 cm. alti, a basi in axillis foliorum ramulos foliosos gerentes. Ochreae pallide bruneae hyalinae valde caducae. Folia omnia consistentia in sicco rigide papyracea, colore pallide viridi, utrinque glabra et levia. Folia caulina inferiora anguste lineari-lanceolata plana vel leviter undata, latitudine 7–10-plo longiora, 10–20 cm. longa, 1.3–2.5 cm. lata, basi ut apice sensim subaequaliter acuminata. Nervi secundarii vix conspicui, a primario angulo ca. 45° abeuntes. Petioli foliorum latitudine folii plerumque breviores. Folia caulina superiora foliaque ramorum axillariorum angustiora et brevius petiolata. Rami inflorescentiae ± tenues singuli simplices vel inferiores iterum ramosi, inferiores interdum angulo recto fere divergentes, paniculam parvam vel maiusculam apertam formantes. Rami inflorescentiae infimi tantum folio suffulti. Florum glomeruli fere omnes contigui foliis non suffulti. Perigoniorum fructiferorum pedicelli in tertia vel quarta parte inferiore tenuiter sed distincte incrassato-articulati, in basin perigonii subito dilatati, perigonio fructifero breviores vel subaequilongi. Perigonii foliola exteriora 1.6–1.8 mm. longa. Perigonii folia interiora (valvae) in statu maturo 3–4 mm. longa, ± 2 mm. lata, ambitu ovato-lingulata, consistentia membranacea, colore virescenti- vel flavescenti-bruneo, basi rotundata, apice obtusiuscula vel acutiuscula, margine integra, facie inconspicue reticulato-nervosa, omnia aequaliter callifera. Callus crassus prominens, colore bruneo- vel flavescenti-aurantiaco, ca. 2 mm. longus, ca. 1–1.2 mm. latus, basi rotundatus apice acutus.

FIG. 13. *Rumex pallidus* Bigel.

Nux ca. 2.5 mm. longa, 1.1–1.2 mm. lata, atrofusca, infra medium latissima, basi breviter, apice longius acuminata.

SYNONYMY: *R. pallidus* Bigel. Flor. Bost. ed. 3. 153. 1840; Gray 355. 1908; Fernald, Rhodora 10: 19. 1908.

DISTRIBUTION: Eastern Canada, northeastern United States, Alaska.

NEWFOUNDLAND: Shores of Random Sound, Trinity Bay, red granite gravel beach, Clarenville (*Fernald & Wiegand*, O). In sand, seashore (*Jansson* 466, St).

NEW BRUNSWICK: Gloucester Co., sandy beach, Miscou Harbor, Miscou Isl. (*Blake* 5566, Wa). Gloucester Co., gravelly shore of Nepisiguit Bay, Bathurst (*Williams & Fernald* 69123, O). Campobello Isl. (*J. D. Smith*, Ca). Low, saline places, Restigouche (*Buttain* 23757, O).

NOVA SCOTIA: Yarmouth Co., gravelly and rocky sea beach, Lower Argyle (*Fernald, etc.* 21035, O, NY). Pebbly beach, Purcell's Cove, Halifax Harbor (*Howe & Long* 1590, NY). Bell's Island (*Macoun*, O).

PRINCE EDWARD ISLAND: Sandy strands and dryish borders of salt marshes, Plat River, Prince Co. (*Fernald & St. John* 11037, Wa, Ca, Ke).

QUEBEC: Seashore, Cap à l'Aigle (*Macoun* 68750, O). Beach of the River St. Lawrence, Berthier (*Fernald & Pease* 25037, O). Lower St. Lawrence, seashore, near Ceaconna(?) (*Pringle*, Wa). Rimouski Co., in fresh or brackish, rich soil in salt marsh by the River St. Lawrence, Bic (*Fernald & Collins* 1005, O).

ONTARIO: On rocks, Tobermory, Bruce Peninsula (*Macoun* 54767, O). Salt marshes, Colpays Bay, Georgian Bay (*Macoun* 23754, O).

YUKON: Dawson, Bonanza Creek (*Eastwood* 446, G). Last island in Klondike River (*Macoun* 91293, O).

NEW HAMPSHIRE: Portsmouth (*Davis*, St).

MAINE: York and vicinity (*Bicknell* 3950, NY).

ALASKA: Glacier Point, old field (*Anderson* 366, Lu). Skagway (*Setchell & Parks*, Ca; *Cowles* 847, Ch). Sitka and vicinity, about roads and lanes (*Wright* 1562, Ca; *Hultén* 8492m, Lu, MW). Kodiak Island, Three Saints Bay (*Eyerdam* 373, Lu, MW). Old Harbor, along seacoast (*Eyerdam* 648, Lu). Davidson Glacier (*Cooper & Andrews* 15, Ch). Bank of Yukon River, Anvik (*Chapman* 18, La).

Rumex pallidus is characterized and distinguished from *R. triangulivalvis* by ovate valves, all bearing large, equal grains so that only a narrow margin of the valve is conspicuous, and by the larger nutlets.

The name *R. pallidus* is used here in a more ample sense than Fernald (loc. cit.) used it, so that individuals showing the typical fruit characters but not having the characteristic diffuse panicle with rectangular, spreading lower branches or the slender stem and narrow leaves are included.

The area of *R. pallidus* in eastern Canada and in the northeastern United States seems to be rather limited. From middle and southwestern Canada I have seen no specimen belonging to this species, but from northwestern Canada (Yukon) and Alaska I have seen specimens differing not at all from some of the eastern, which have a strict habit, larger leaves, and more erect fruiting branches. *R. pallidus* seems to avoid the inland and to prefer maritime regions.

Explanation of Figure 13.—Rumex pallidus Bigel., half natural size; Nova Scotia, *Fernald* 21053. Valves 4 times natural size: (*a*) Nova Scotia, *Howe* 1590; (*b*) Vancouver Island, *Macoun* 83927.

20. **Rumex sibiricus** Hultén. Figure 14

Perennis. Caulis tenuis gracilis ascendenti-erectus strictus vel subflexuosus, (20–) 35 (–70) cm. altus, pallide bruneus saepe purpureo-suffusus, tenuissime sulcato-striatus, glaber laevis, plerumque a basi ex axillis foliorum ramulos foliosos emittens. Ochreae albidae brunnescentes hyalinae caducae. Folia omnia consistentia in sicco papyracea, colore pallide viridi, levissime papillosa vel glabra et levia. Folia caulina anguste lineari-lanceolata, plana vel leviter undata, latitudine 6–8-plo longiora, ad 8 cm. longa, ca. 1 cm. lata, basi et apice subaequaliter sensim acuminata. Nervi secundarii vix conspicui a primario angulo ca. 45° abeuntes; petioli foliorum 1.5–3 cm. longi. Folia caulina superiora angustiora brevius petiolata. Rami inflorescentiae tenues singuli simplices, primum suberecti, deinde inferiores quidem patentes, paniculam laxiusculam apertam formantes. Rami infimi tantum folio suffulti, florum glomeruli inferiores remoti, superiores contigui, omnes foliis non suffulti. Perigoniorum fructiferorum pedicelli prope basin tenuiter incrassato-articulati, in basin perigonii subito subinflato-dilatati, perigonio fructifero subbreviores vel aequilongi vel sublongiores: 1.5–3.5 mm. longi. Perigonii foliola exteriora ca. 1.5 mm. longa lanceolata acuta. Perigonii folia interiora (valvae) in statu maturo 2.5–3 mm. longa, 1.5–2 mm. lata, ambitu ovato-lingulata, consistentia membranacea, colore

FIG. 14. *Rumex sibiricus* Hultén.

brunea, basi rotundato-angustata, apice obtusiuscula vel acutiuscula, margine integra, facie inconspicue nervosa, omnia aequaliter callifera. Callus crassus prominens, colore bruneo-aurantiaco, 1.7–2 mm. longus ± 0.8 mm. latus, acute in nervum medianum valvae abiens. Nux 2–2.5 mm. longa, 1–1.2 mm. lata, infra medium latissima, basi brevius apice longius acuminata atrofusca (punctis tenuissimis opaca).

SYNONYMY: *R. sibiricus* Hultén, Fl. Kamtchatka 2: 48. 1928 (Sv. Vet. Akad. Handl. III. 5, No. 2). *R. salicifolius* auctorum veteris orbis, non Weinm. *R. salicifolius* var. *angustifolius* Meisn. apud DC. 47. 1856.

ILLUSTRATION: Hultén, loc. cit.

DISTRIBUTION: Northern and eastern Siberia and Kamchatka.

SIBERIA: Jenisei: Sopotschnoj Island (*Lundström*, St; leaves only, mixed with *R. maritimus*); Wikandrovsky Island (*M. Brenner*, St; type of *R. sibiricus*); Plachino 68° 5′ (*M. Brenner*, St, UW; no fr.).—Oblastia Jakutsk: Kumasch-Sur, 71° 30′ (*H. N. Nilsson*, St; no fr.); Balaganach, 71° 35′ (*H. N. Nilsson*, St; no fr.); Bulun, 70° 43′ (*H. N. Nilsson*, St). Kolyma River (*Augustinowicz*, Ko, UW, MW; no fr.).

KAMCHATKA: Shtchapina (*Komarov* 4872, MW; no fr.).—For further indications, see Hultén, loc. cit.

Rumex sibiricus is the only extra-American species of the *Salicifolii*. I include it here to make the treatment of this group complete.

R. sibiricus is closely related to *R. pallidus* Bigel., but its stem is more slender, the branches of the fruiting panicle are very widespreading, the leaves usually (but not always) very thin and narrow. The principal characters lie in the much smaller fruiting perigonia with narrower, more pointed grains and smaller, narrower nutlets. Most of the specimens examined are flowering, but usually easily recognized by habit and vegetative characters.

Explanation of Figure 14.—*Rumex sibiricus* Hultén, half natural size; collected by *Brenner*. Valves 4 times natural size, *Brenner*.

21. **Rumex utahensis** Rech. f. Figure 15

Perennis. Caules complures stricte erecti rarius subflexuosi vel arcuato-ascendentes, graciles vel validi, humiles 15–40 (–60) cm. alti, tenuiter sulcato-striati, glabri, laeves, bruneo-virescentes vel purpureo-suffusi, plerumque a basi in axillis foliorum surculos foliosos proferentes. Ochreae albidae vel pallide bruneae hyalinae caducae. Folia omnia in sicco consistentia tenuiter papyracea, plana vel leviter undata, colore pallide flavescenti-viridi, utrinque glabra et laevia.

FIG. 15. *Rumex utahensis* Rech. f.

Nervi secundarii angulo ca. 45° a primario abeuntes. Petioli foliorum laminae latitudinem aequantes vel paulum superantes. Folia caulina inferiora lanceolata, latitudine 4–5-plo longiora, basi breviter, apice longius angustata. Folia caulina superiora foliaque ramorum axillariorum angustiora brevius petiolata. Rami inflorescentiae singuli simplices, breves, raro infimi elongati iterum ramosi, erecti paniculam parvam confertam compactam formantes. Rami infimi tantum folio suffulti. Florum glomeruli approximati in statu fructifero contigui. Perigoniorum fructiferorum pedicelli tenues, prope basin insensibiliter incrassato-articulati, in basin perigonii subinflato-dilatati, perigonio maturo breviores. Perigonii foliola exteriora 1–1.5 mm. longa. Perigonii folia interiora (valvae) in statu maturo 2.5–3 mm. longa et lata ambitu late scutato-deltoidea, consistentia in sicco tenuiter membranacea, colore pallide bruneo, basi truncata apice acutiuscula, margine subintegra, facie tenuiter et regulariter elevate reticulato-nervosa nervatura in utroque latere nervi mediani 3–4 maculas lata. Nervus medianus ceteris validior et magis prominens plerumque non callifer, hinc inde autem in callum minutissimum incrassatus. Nux matura 1.8–2 mm. longa, 1.1–1.3 mm. lata, atrofusca fere nigra, infra medium latissima, basi breviter, apice longius acuminata.

SYNONYMY: *R. utahensis* Rech. f. Repert. Sp. Nov. 40: 298. 1936. *R. mexicanus* Rydb. R. 232. 1922, p.p., non Meisn.; Tidestrom 160. 1925, p.p., non Meisn.

DISTRIBUTION: Rocky Mountains between 36° and 43° N. Lat.

ALBERTA: Calgary (*Macoun*, O; leaves narrow).

WYOMING: Laramie, Albany Co., in saline soil, abundant (*A. Nelson* 8083, SL).

COLORADO: Leadville (*Trelease*, SL; no fr.). Fremont Co. (*Brandegee* 191, Ca). Georgetown (*Fritchey* 16, SL; no fr.). Clear Creek Valley above Empire (*Engelmann*, SL; *Patterson*, Ch). Summit Co., near Breckenridge, 2,910 meters (*K. K. Mackenzie* 349, La, SL; *Brandegee* 6916, SL). Mesquite Creek (*Tidestrom* 4123, Wa). Manitou Park (*Trelease*, SL). Columbine Ranch (*Hedgcock* 354, La).

IDAHO: Lewiston, Nez Perce Co. (*Heller* 3236, Ca).

UTAH: Wasatch Mts., Peterson Canyon, 2,400–3,000 meters (*Pammel & Blackwood* 3957, SL). Head of Middle Fork of Manti Canyon (*Coville & Tidestrom*, Wa). Ephraim Canyon, 2 miles below summit, 2,700 meters (*Tidestrom* 307, Wa). Wasatch Plateau, east of Ephraim (*Tidestrom* 214, 2468, Wa). Common in ponds, aspen zone, Ephraim Canyon, 2,400 meters (*Tidestrom* 1249, Wa; no fr.).

Abundant on rocky slope, Eccles Canyon, east of Mt. Pleasant, 2,880 meters (*Tidestrom* 1880, Wa). Prince Canyon at Kyune, 1,950 meters (*Jones* 5603j, Wa). Divide between Sevier and Beaver rivers, near Belknap Peak (*Rydberg & Carlton* 7336, Wa; no fr.). Huntington Canyon, Emery Co. (*Garrett* 7019, Ch).

NEVADA: Slide Mountain, in granite, 2,340 meters, Washoe Co. (*Heller* 10952, NY, Ke; no fr.). Washoe Co., Mt. Rose, 2,895 meters (*Heller* 10654, Wa). Drying mud bottom, 1,740 meters, Mountain City (*Nelson & Macbride* 2181, Be, St).

OREGON: Hood River Co., Columbia River bottoms (*Henderson* 493c, f, SL).

LOCALITY INDEFINITE: Rocky Mts., Lat. 39°–40° (*Hall & Harbour* 496, Wa, SL, De, MW). Porcupine River (*D. Smith* 196, Ke). "S. Utah, N. Arizona, etc." (*Palmer* 421, SL).

The valves of *R. utahensis* are small and without tubercles, and in this respect similar to those of *R. californicus* Rech. f., having more pronounced teeth on the margin, but the habit of these two species is usually very different. *R. utahensis* has short and stout, little branched stems, relatively broad leaves, and a small and very contracted fruiting panicle. *R. californicus*, on the contrary, has elongate, slender, much branched stems, narrow leaves, and an elongate, somewhat lax panicle. The plant described by Jepson, 292, 1923, as *R. salicifolius* var. *montigenitus* shows intermediate characters between *R. californicus* and *R. utahensis*.

Flowering specimens of *R. utahensis* are not to be distinguished from *R. triangulivalvis* var. *oreolapathum* Rech. f., because the habit of this Rocky Mountain variety of the widespread *R. triangulivalvis* is exactly the same. I believe that *R. utahensis* is nearly related to *R. triangulivalvis* var. *oreolapathum*, and that the first may be considered a grainless parallel type of the latter. As this grainless type is strictly limited to the Rocky Mountains and occurs there in the same areas as *R. triangulivalvis* var. *oreolapathum*, without intermediates, it gives the impression of a certain independence and may be maintained for the present as a distinct species.

Explanation of Figure 15.—Rumex utahensis Rech. f., half natural size; Utah, *Jones* 5603j. Valves 4 times natural size, from *Tidestrom* 307.

22. **Rumex crassus** Rech. f. Figure 16

Perennis. Caules complures validi procumbentes vel flexuoso-ascendentes, 20–50 cm. longi, basi levius apicem versus profundius

sulcato-striati, glabri laeves, bruneo-virescentes vel purpureo-suffusi, a basi ex axillis foliorum ramos foliosos serius elongatos floriferos proferentes. Ochreae pallide bruneae hyalinae caducae. Folia omnia in sicco consistentia crasse et rigide coriacea, colore olivaceo vel obscure viridi vel brunnescente subtus pallidiore, utrinque glabra et levia. Nervi secundarii foliorum angulo 45°–60° a primario abeuntes. Petioli laminae latitudinem aequantes vel superantes. Folia caulina inferiora ovato- vel oblongo-lanceolata, plerumque infra medium latissima, latitudine (2–) 2.5–3.5 (–4) -plo longiora, basi anguste vel late cuneata vel interdum fere rotundata, apicem versus angustata, acuta. Folia caulina superiora foliaque ramorum axillariorum angustiora brevius petiolata. Rami inflorescentiae breves validi singuli simplices, infimi tantum folio suffulti, florum glomerulis omnibus approximatis in statu fructifero contiguis, paniculam ± parvam compactam confertam formantes. Perigoniorum fructiferorum pedicelli validi, in tertia vel quarta parte inferiore incrassato-articulati, ad basin perigonii nodoso-incrassati, perigonio maturo (1–) 1.5 (–2) -plo longiores. Perigonii foliola exteriora ca. 2 mm. longa. Perigonii folia interiora (valvae) in statu maturo 4–5 mm. longa, 3–4 mm. lata, ambitu ovato- vel deltoideo-lingulata, consistentia in sicco membranaceo-coriacea, colore atrobruneo-purpureo, basi rotundata, apice acuta, margine minute irregulariterque crenulato-denticulata. Valva anterior callum maximum ovatum ± 4 mm. longum, ± 2.5 mm. crassum, totam fere faciem valvae abscondentem ferens, valvae ceterae valide reticulato-nervosae, nervo mediano ceteris crassiore ± plerumque autem non callifero, rarissime callum minutum proferens. Nux matura 2–2.5 mm. longa 1.7–2.1 mm. lata vix infra medium latissima basi rotundata, apice breviter acuminata.

SYNONYMY: *R. crassus* Rech. f. Repert. Sp. Nov. 40: 295. 1936. *R. salicifolius* Fernald, Rhodora 10: 78. 1908, non Weinm.; Watson 8. 1880, p.p.; Trelease 87. 1892, p.p.; Jepson 292. 1923, p.p.

DISTRIBUTION: California, Oregon.

OREGON: Beach, Newport, Lincoln Co. (*Spillman*, P, Ch). Beach, Seal Rock, Lincoln Co. (*Peck* 10575, Ch).

CALIFORNIA: Northern coast region, edge of salt marsh, Samoa, Humboldt Bay, 0–150 meters (*Tracy* 2549, Ca). San Mateo Co., Farallon(?), seashore (*Skottsberg*, Up). San Mateo Co., partially stabilized sand dunes, 2 miles south of Pigeon Point (*E. A. Purer* 5373, SL). Lassen Co. (*Baker & Nutting*, Ca). Near Eagle Lake, Lassen Co. (*Baker*, Ca). San Francisco (*Ponten*, Up; *N. J. Andersson*, Up, St; *Grunow*, MW; ?, SL). Pt. Lobos, San Francisco (*Eastwood*

FIG. 16. *Rumex crassus* Rech. f.

1565, SL). Beach near Cliff House, San Francisco (*Heller*, SL). Sea strand, Cliff House (*Engelmann*, SL). Pacific Grove, Monterey Co. (*Elmer* 4084, Ca, G). Wet places down beach cliffs south of Pacific Grove (*F. M. Muller*, Ut). Oakland (*B. Davy*, Ca). Santa Cruz (*C. S. Anderson*, SL). Santa Cruz Mts. (*Kellogg*, K, M; *McLean*, SL). Santa Cruz, sand dunes along coast (*C. N. Thompson*, SL). San Pedro (*Hinds* 1941, Ke). Berkeley (*Blankinship*, SL). Bolinas Bay (*B. Davy* 1212, Ca). Farallon City (*Setchell*, Ca). Am Strande im Tennessee Tale (*Suksdorf* 466, P).

This species has been taken by Fernald in Rhodora (loc. cit.) for the genuine *R. salicifolius*, which it resembles in that only one of the inner fruiting perigonium segments bears a very large and swollen grain covering nearly the whole surface of the segment; but the leaf measurements given by Weinmann do not agree with this plant. The fruiting perigonia and the nutlets of *R. crassus* are more than twice as large and the leaves are shorter and broader, the stem often procumbent or ascending. The habit of *R. crassus* is peculiar and hardly to be compared with that of other species of the *Salicifolii*.

Explanation of Figure 16.—Rumex crassus Rech. f., half natural size; San Mateo, California, *Skottsberg*. Valves 4 times natural size; San Francisco, *Andersson*.

23. **Rumex salicifolius** Weinm. Figure 17

Perennis. Caulis ascendens vel erectus, flexuosus, tenuis sed firmus, 30–90 cm. altus, tenuiter sulcato-striatus, bruneus saepe purpureo-suffusus, plerumque a basi ramos foliosos serius florentes et elongatos arcuato-divergentes emittens. Ochreae bruneae membranaceae caducae. Folia omnia plana, glabra et laevia, consistentia in sicco rigide coriaceo-membranacea, colore pallide olivaceo, angustissime membranaceo-marginata, nervi laterales angulo ± 45° a mediano abeuntes. Petiolus folii laminae latitudinem aequans vel paulo superans. Folia caulina inferiora anguste lanceolata, basi apiceque aequaliter sensim angustata, latitudine ± 7-plo longiora, ad 13 cm. longa. Folia caulina superiora et folia ramealia sensim minora et angustiora. Rami inflorescentiae tenues tenaces singuli simplices, ab axi principali angulo ca. 45° arcuato-patentes, infimi tantum folio suffulti, paniculam saepe elongatam ± apertam formantes. Florum glomeruli infimi remoti, superiores contigui compacti, omnes foliis suffulcrantibus carentes. Perigoniorum fructiferorum pedicelli perigoniis maturis (1–) 1.5 (–2) -plo longiores, tenues sed firmi, prope basin tenuiter incrassato-articulati, ad basin perigonii subito ali-

FIG. 17. *Rumex salicifolius* Weinm.

quantum incrassati. Perigonii foliola exteriora anguste lanceolata acuta basibus interiorum appressa, 1.2–1.5 mm. longa. Perigonii folia interiora (valvae) in statu maturo 2.3–3 mm. longa, 1.7–2.1 mm. lata, consistentia coriaceo-membranacea, colore bruneo-rufescenti, ambitu deltoideo, apice acuta, margine subintegra vel minutissime irregulariter denticulata. Valva anterior callum magnum ovatum totam fere faciem valvae abscondentem proferens, valvae alterae plerumque ecallosae, facie tenuiter prominenter reticulato-nervosae, nervo mediano ceteris validiore. Nux matura atrobrunea, 1.8–2 mm. longa, 1.1–1.3 mm. lata, basi brevius, apice longius acuminata, paulum infra medium latissima.

SYNONYMY: *R. salicifolius* Weinm. Flora 4: 28. 1821; Meisn. apud DC. 47. 1856, p.p.; Watson 8. 1880, p.p.; Trelease 87. 1892, p.p.; Jepson 292. 1923, p.p. (non Fernald, Rhodora 10: 18. 1908). *R. salicifolius* subsp. *angustivalvis* Danser, var. *unigranis* Danser, Nederl. Kruidkund. Archief 415. 1925 (appeared in 1926).

ILLUSTRATIONS: Danser, op. cit. *f. 1, 3–5.*

DISTRIBUTION: Middle and southern California; northern Mexico.

CALIFORNIA: San Bernardino Co., dry, sandy bank of Santa Ana River (*Parish* 11239, Ca, SL; 1507, UW). Santa Catalina Isl. (*L. W. Nuttall* 854, SL; 326, Ch; 854, Ch). Santa Catalina Isl., Avalon (*Blanche Trask*, SL). San Clemente Isl., vicinity of Mosquito Harbor (*Abrams & Wiggins* 366, Ca). San Clemente Isl., canyon about 3 miles southeast of Casa Blanca (*Munz* 6679, Ca; no fr.). San Diego Co., San Onofre Creek, near coast (*Abrams* 3282, SL, Ko; no fr.). San Diego Co., Witch Creek (*Alderson*, Ca). San Diego Co., Rio Juana (*Stokes*, Be). Claremont, 360 meters (*H. P. Chandler*, Ca). Mountains near Claremont (*Crawford*, Ca, SL). Santa Clara Co., bottom of Coyote Creek (*Dudley* 4133, Wa). Santa Clara Co., Saratoga (*B. Davy* 250, Ca). Los Angeles Co., Malibu (*Barber*, Ca). Los Angeles Co., Kings Canyon (*Dudley & Lamb* 4351, St). Kings River (*Eisen*, Up). Los Angeles (*H. E. Hasse*, SL). Pescadero, Monterey Co. (*F. Guirado* 695, Wa). San Francisco (*Brandegee*, SL). Santa Barbara Co. (*Baker*, Ca). Santa Barbara Co., near Mono Ranger Station, 450 meters (*A. L. Grant* 1744, SL). Alameda (*Kellogg*, Ca). Hills south of Camp 72 at Corral Hollow, Alameda Co. (*Brewer*, Wa). Santa Cruz (*Thompson*, SL). Boulder Creek, Santa Cruz Co. (*Walker* 799, Ca). Santa Cruz Isl., vicinity of Smuggler's Cove (*Abrams & Wiggins* 206, Ch, Ca). Mt. Shasta, Sisson, Lower Transitional Zone (*Setchell & Dobie*, Ca). Owens Valley and Fort Tejon (*Horn*, Wa). Mt. Pinos, Ventura Co., Lockwood Valley,

Upper Sonoran Zone, 1,560 meters, (*Hall* 6696, Ca). Bolinas Bay (*B. Davy*, Ca). Near Elsinore (*Latchie* 51, Ca). Soldiers Home (*Adams* 6, Ca). Sierra Nevada, Tehipite Valley, Fresno Co., 1,200 meters (*Hall & Chandler 494*, Ca). Samoa, Humboldt Co. (*H. H. Smith* 3866, NY). Mexican Boundary Line near White Water (*Mearns* 2302, NY). Siskiyou Co., along creek near Yreka (*Butler* 512, Ca). Without locality (*Coulter* 695, Ke; *Lambert*, Up; *State Survey* 1219, Ca).

MEXICO: Sonora (*Thurber* 324, G, Ch). San Pedro Mártir (*Brandegee*, Ca; no fr.).

CULTIVATED: "*Rumex salicifolius* mihi, e California. Ex hort. Pawl." (Up; type). "Ex Hort. Hafn., Semin. e California misit *Weinmann*" (Ko). Ex sem. Calif., cult. Athens, Illinois (*Elihu Hall*, SL, St). Cult. (*Buysman Hb. Analyt.* 1094, Ut, sub. n. *R. sanguineus*).

I have studied Weinmann's type specimen in the Upsala Herbarium and cultivated specimens in the Copenhagen Herbarium grown from seeds sent by Weinmann. The measurements of leaves given by Weinmann in his short description correspond exactly with this plant but not at all with the broad- and short-leaved, large-fruited plants taken by Fernald in Rhodora for the genuine *R. salicifolius*.

Our figure shows Weinmann's type specimen, representing an early state of development, in which the axillary branches are not yet elongate and flowering. Later the ramification of *R. salicifolius* is very abundant and then the habit is quite different, closely simulating that shown by our figure of *R. californicus*.

R. salicifolius is characterized by the small fruiting perigonia with only one segment bearing a grain; but this grain is very large and covers the whole surface of the perigonium segment.

As to the differences from the next related species, *R. crassus* Rech. f. and *R. californicus* Rech. f., see under those species. These three species are almost limited to California.

Explanation of Figure 17.—Rumex salicifolius Weinm., half natural size, type. Valves 4 times natural size, from *Dudley* 4351.

24. **Rumex californicus** Rech. f. Figure 18

Perennis. Caulis ascendens vel suberectus, 30–60 cm. altus, ± angulato-flexuosus vel strictus, plerumque gracilis sed firmus, virescens vel brunnescens, tenuiter sulcato-striatus, saepe iam a basi vel infra medium in axillis foliorum ramos foliosos arcuato-divergentes tenues flexuosos emittens. Ochreae albidae valde caducae.

Folia caulina et ramealia lineari-lanceolata ± plana, in sicco rigide subcoriacea, obscure viridia, nervi laterales vix conspicui a mediano angulo ± 45° abeuntes, ut tota planta glabra et levia, angustissime membranaceo-marginata, basin et apicem versus aequaliter sensim angustata. Folia inferiora ad 10 cm. longa, ad 1.5 cm. lata, petiolo latitudinem folii ± aequante; folia superiora sensim minora angustiora brevius petiolata. Rami inflorescentiae tenues singuli simplices, ab axi principali angulo 30°–50° arcuato-divergentes vel axi fere appressi, inferiores folio suffulti paniculam laxiusculam apertam vel densiusculam elongatam formantes. Florum glomeruli multiflori, infimi ± remoti, superiores approximati vel omnes approximati, in statu fructifero contigui omnes foliis suffulcrantibus carentes. Perigoniorum fructiferorum pedicelli in tertia vel quarta parte inferiore tenuiter incrassato-articulati, ad basin perigonii subito subinflato-dilatati, perigoniis maturis aequilongi vel 1.5 (2) -plo longiores. Perigonii foliola exteriora ovato-lanceolata acutiuscula, ± 1.8 mm. longa, dimidiam latitudinem interiorum aequantia vel paulo superantia. Perigonii folia interiora (valvae) in statu maturo ± 3 mm. longa, ± 2.5 mm. lata, ambitu late triangularia, consistentia crasse membranacea, colore fusco (bruneo-rufescente) basi truncata vel late cuneata apice acuta vix producta margine basin versus minute irregulariter denticulata, facie tenuiter sed prominenter reticulato-nervosa, nervo mediano ceteris validiore interdum longitudinaliter incrassato. Nux matura atrofusca vel fere nigra, ca. 2 mm. longa, ca. 1.3 mm. lata, basi et apice subaequaliter acuminata, paulum infra medium latissima.

SYNONYMY: *R. californicus* Rech. f. Repert. Sp. Nov. 40: 297. 1936. *R. salicifolius* auct. californ. p.p., non Weinm. *R. salicifolius* var. *denticulatus* Torr. Bot. Mex. Bound. 178. 1859.

DISTRIBUTION: California and Arizona.

OREGON: "Auf fremder Erde (ballast) oder nahe dabei," Albina, Portland (*Suksdorf*, P).

ARIZONA: Tucson (*Toumey* 343c, Wa).

CALIFORNIA: Shasta Co., near Middle Creek Station (*Heller* 7914, Ca). Oakland (*B. Davy*, Ca). Alameda Co., sandbars, Miles Canyon, Lunol (*D. Demaree* 10514, SL). Berkeley (*Blankinship*, SL; mixed with *R. crassus*). Hot Spring Valley, Lassen Co. (*Austin*, Wa). Bottom Coyote Creek, Santa Clara Co. (*Dudley* 4133, NY). Cleveland Nat. Forest, Julian (*Hitchcock*, Wa). Lake Co., Kelseyville, waste places, weed (*Blankinship*, SL). Copperopolis, Calaveras Co., 300 meters, wet ground along creek (*Tracy* 5620, Ca). Alpine, San

FIG. 18. *Rumex californicus* Rech. f.

Diego Co. (*Mearns* 2988, Wa). San Joaquin Co., Stockton, in sand in Calaveras River bottom (*Stanford* 436, SL). Los Angeles Co., open, sandy, moist plains (*Grant* 4432, Wa, partly). San Jacinto Mts., 1,500 meters (*H. M. Hall* 749, Wa). Saunder's Meadow, San Jacinto Mts., 1,650 meters (*C. V. Meyer* 586, Ca; type of *R. salicifolius* var. *montigenitus* Jepson). San Jacinto Valley (*Reinhardt*, Ca). Coloma (*Andersson*, St). "California" (*Alraun* 5300, NY).

Rumex californicus is characterized by small, broadly triangular valves without or with only a suggestion of a grain. The valves are finely denticulate at the margin toward the base. In habit and in shape of the leaves it is similar to the genuine *R. salicifolius* Weinm. Like that species it has often relatively long pedicels. In flower these two species can not be distinguished. Both are limited to California and Arizona.

I consider that *R. salicifolius* var. *denticulatus* Torr. must be this plant, but the name *denticulatus* can not be transferred to specific rank because there exist older homonyms by Campdera and C. Koch. *R. salicifolius* var. *montigenitus* Jepson (292. 1923) seems to form a link between *R. californicus* and *R. utahensis* (see remarks under the latter).

Explanation of Figure 18.—Rumex californicus Rech. f., half natural size; California, *Demaree* 10514. Valves 4 times natural size, from *Grant* 4432.

25. **Rumex cuneifolius** Campd.

Widely creeping, with somewhat fleshy, obovate leaves and small fruiting panicles; leaves somewhat crisped marginally, the rather short petioles and leaf nerves somewhat scabrous beneath; branches of the panicle few, short; whorls usually approximate, without leaves; pedicels thickish, shorter than the fruit, usually jointed at the middle; valves firm, triangular-ovate, entire, 4–5 mm. long, all with a prominent grain; ripe nutlets dark brown, broadest in the middle, about 2.5 mm. long.

This species of peculiar habit is widespread in southern South America and introduced to some parts of North America and Europe. The height of stems, thickness of leaves, and size of valves are variable.

SYNONYMY: Campd. Mon. Rumex 95. 1819; Rech. f. Vorarb. 3, Arkiv för Bot. 26A, No. 3: 20. *pl. 5.* 1933.

ALABAMA: Ballast, Mobile (*Mohr* 1, SL).

OREGON: Ballast at Albina, Portland (*Suksdorf* 1798, G, P; 730, 1211, P).

26. **Rumex hymenosepalus** Torr. Figure 9, *b*

Perennis, "with clusters of tuberous roots" (ex Rydberg). Caulis erectus vel ascendens, internodiis ± brevibus, validus fistulosus flavescens vel virescens, ± flexuosus, tenuiter sed crebre canaliculato-striatus 30–100 cm. altus. Ochreae albidae hyalinae maiusculae. Folia omnia in vivo ut videtur crasse carnosa, in sicco crasse membranacea vel subcoriacea, glabra et levia vel subtus imprimis secus nervos ± papilloso-scabra, undulata et insuper margine crispa. Folia basalia oblongo- vel anguste obovato-lanceolata, basi anguste cuneata, apice acutiuscula, rarius obtusiuscula, latitudine 3–4-plo longiora, plerumque paulo infra medium latissima. Nervi secundarii foliorum angulo ± 45° a mediano abeuntes fere recti vix arcuati. Petiolus foliorum basalium crassus, in vivo carnoso-succosus, dimidiam circiter longitudinem folii aequans. Folia caulina anguste lanceolata, basi apiceque fere aequaliter angustata, breviter petiolata, summa subsessilia. Rami inflorescentiae breves vel inferiores interdum elongati, singuli vel 3–5-ni, e basi arcuata erecti vel subpatuli, paniculam parvam rarius amplam ± contractam in statu fructifero compactam formantes; axis ramique plerumque ± flexuosi. Florum glomeruli multiflori foliis suffulcrantibus carentes in statu fructifero omnes contigui. Pedicelli fructiferi tenuiter filiformes, breves, perigonium fructiferum ad summum aequantes, in tertia parte inferiore vel paulo infra medium insensibiliter articulati ad basin perigonii subito turbinato-incrassati; inter pedicellos raro ramulus brevissimus erectus apice flores normales proferens. Perigonii foliola exteriora ca. 2 mm. longa, in emarginatione angusta foliorum interiorum reflexa. Perigonii folia interiora (valvae) in statu fructifero ambitu oblongo- vel rotundato-cordata, ex emarginatione 11–12 mm., lobis basalibus inclusis 14–15 mm. longa, 10–12 mm. lata, latitudine circiter equilonga vel evidenter longiora, consistentia tenuiter membranacea, colore pallide stramineo vel pallide carneo-bruneo, in statu iuvenili saepius purpureo- vel roseo-suffusa, margine integerrima, basi anguste et profunde sinuato-emarginata, apice obtusiuscula vel subacuta, facie regulariter et tenuiter reticulato-nervosa, nervo mediano ceteris validiore sed minime quidem callifero, reticulo marginem versus ± evanescente. Nux matura brunea, 4–5 mm. longa, ± 3 mm. lata, basi rotundato-truncata apice breviter acuminata infra medium latissima.

SYNONYMY: *R. hymenosepalus* Torr. Bot. Mex. Bound. 177. 1858; Wats. 8. 1880; Trelease 80. 1892; Small 370. 1903; Woot. & Standl. 191. 1915; Rydb. R. 231. 1922; Jepson 291. 1923; Tidestrom 160. 1925. *R. arizonicus* Britt. Trans. N. Y. Acad. Sci. 7: 73. 1889. *R. Saxei* Kellogg, Pacif. Rural Press 7: 371. June, 1879.

ILLUSTRATIONS: Trelease 1892, *pl. 18;* Bot. Mag. 121: *pl. 7433* (=var. *salinus*).

DISTRIBUTION: Southwestern United States and Mexico.

WYOMING: Bitter Creek (*A. Nelson* 4780, Wa; intermediate between *eu-hymenosepalus* and *salinus*). Bitter Creek, Sweetwater Co. (*A. Nelson* 3114, Co; type of *tuberosus* A. Nelson). Seven Mile Lake (*E. Nelson* 4332, La; var. *salinus*). Red Desert, Orenda Butte (*A. Nelson* 7141, La; var. *salinus*).

COLORADO: Sandy canyon, entrance Mesa Verde National Park (*Nelson* 421, Ca). Hillsides, Surface Creek, Mesa Grande, 1,860 meters (*Purpus* 9, Mu; *eu-hymenos.; Purpus* 9, Be; *sal.*(?); no ripe fr.). Palisades (*Crandall* 3833, P, NY, Wa; *eu-hym.*). Dry, adobe flat, 1,620 meters, Paradox, Montrose Co. (*Walker* 202; leaves only). Dry hillside, 1,620 meters, Naturita (*Payson* 233, St, no ripe fr.; P). Junction of Navajo and Spruce Canyon 1,900 meters (*Schmoll & Nusbaum* 1654, La; var. *salinus;* no ripe fr.)

NEW MEXICO: Aztec (*Baker* 296, Ca, P, Wa, Ke, Be, Z; *sal.*(?)). Gray, Lincoln Co., 1,800 meters (*Skehan* 22, MW; *eu-hym.*). Organ Mts., Dona Ana Co. (*Wooton,* Ca. no fr.). Agricultural College, Mesilla Valley, Dona Ana Co. (*Wooton,* Ch, P, Wa; no ripe fr.). Mangas Springs, 18 miles northwest of Silver City, Grant Co., 1,430 meters (*Metcalfe* 56, Ca, Wa; no ripe fr.). Sierra Co., 1 mile west of Hillsboro, 1,650 meters, sandbar (*Metcalfe* 1545, Wa, Be; no ripe fr.). Near Agricultural College (*Standley,* Wa; *eu-hym.*). Without locality (*Wright* 1782, Bo). Sandia Mts. 2,878 meters (*Castetter* 1782, La; prob. *eu-hym.*).

TEXAS: Toyah Creek (*Tracy & Earle* 90, Be; *sal.,* Wa, MW; no ripe fr.). Estelline, sandy soil (*Reverchon* 4248, Wa; no ripe fr.). Frijoles–El Paso (*Nelson* 11443, La; appr. var. *salinus*). Sweetwater, Nolan Co. (*Reverchon* 1349, Ch).

UTAH: St. George, 600 meters (*Jones* 1643, Be, UW, Bu). Santa Clara, 900 meters (*Jones* 5112, Ca, La; *eu-hym.*).

ARIZONA: Tucson (*Toumey,* Wa, no ripe fr.; Ca, NY; all *sal.*). Fort Verde (*Mearns* 300, NY, Co; type of *R. arizonicus* Britt.; no ripe fr.). Verde (*W. W. Jones,* Ca; *sal.*). Sandy river bank, Tempe

(*Ganong & Blaschka*, Be; *sal.*). Phoenix (*Kunze*, NY; no ripe fr.). In plowed fields at Calabasas (*Tidestrom* 885, Wa; no ripe fr.).

NEVADA: Scattered in sandy draws, Moapa, 500 meters (*Tidestrom* 8613, Wa, St; no ripe fr.).

CALIFORNIA: Newhall, dry, sandy soil, (*Pringle*, Wa, Ke; *sal.*). Guadalupe Ranch, Tehachapi, Kern Co. (*B. Davy* 2174, Ca; leaves only). Sand flats, South Fork Valley, 2 miles east of Weldon, Kern Co. (*Voegelin* 89, Ca; *eu-hym.*(?)). Vicinity of San Diego, in sandy fields, 60 meters (*Spencer* 141, Ca, Mu; *eu-hym.*). Oneonta, San Diego Co. (*Chandler* 5073, NY; *eu-hym.*). Santa Maria, low land near river bed (*Condit*, Ca; intermediate between *eu-hym.* and *sal.*). Whitewater (*Vasey*, Wa, Ke; no ripe fr.). Vicinity of San Bernardino, 300–750 meters (*Parish* 4634, Wa; intermediate between *eu-hym.* and *sal.*). San Bernardino Valley washes (*Parish* 11712, Ca; no ripe fr.). Sandy mesas, San Bernardino (*Parish* 678, MW; *eu-hym.*, Ca, Wa, Be, Mu; no ripe fr.). Rock Springs, 2,340 meters, San Bernardino Co. (*Ferris* 7319, NY). Antelope Valley, Llano Verde (*B. Davy* 2567, Ca; *eu-hym.*). Antelope Valley (*B. Davy* 2591, Ca; leaves only). Claremont (*C. E. Howery*, SL; no ripe fr.). Colton (*M. E. Jones*, Be; intermediate between *eu-hym.* and *sal.*, Bu; no ripe fr.). Ramona (*Brandegee*, Ca; no ripe fr.). Palm Spring, 120 meters, in sandy wash (*Jaeger* 908, Wa; intermediate between *eu-hym.* and *sal.*). Hoxin's Ranch, near Nipoma (*Brewer* 405, Wa; *eu-hym.*). Los Angeles (*Hasse*, Ch). Azusa, Los Angeles Co. (*H. H. Smith* 4929, Ch; var. *salinus*). Covina (*Grant* 1141, Ch). San Dieguito Valley (*Angier*, Ch; var. *salinus*). Pacific Beach (*Snyder*, Ch). Pasadena, sandy soil (*McClatchie*, NY; no ripe fr.). California (*Vasey* in 1881, Le).

MEXICO: Chihuahua, near San Diego (*Hartmann* 618, Wa, Ca; no ripe fr.). Vicinity of Chihuahua, 1,300 meters (*Palmer* 27, NY, Ch, Be, Wa, G; *salinus*). Northern Lower California (*Orcutt*, Ca; *eu-hym.*; Ch, *sal.*). San Quentín Bay (*Palmer* 689, Wa; *eu-hym.*).

Rumex hymenosepalus is not related to any other species. It is characterized by the tuberous roots, the somewhat succulent stems without axillary branches, large ocreae, fleshy, acuminate leaves, and large, delicate, grainless valves. From *R. venosus*, with which *R. hymenosepalus* may be compared on account of the valves, it is easily distinguished by its straight, upright, more vigorous stem, by the lack of axillary branches, much larger, thicker leaves, much smaller fruiting perigonia, etc.

Two varieties, recognizable only in fruiting state and connected by intermediates, seem to deserve designation:

Var. **eu-hymenosepalus** Rech. f., var. nov.—Nux ca. 5 mm. longa. Valvae fructiferae ambitu elliptico-cordatae, apice acutiusculae, latitudine evidenter longiores.

Var. **salinus** (A. Nels.) Rech. f., comb. nov.—*R. tuberosus* A. Nels. Bull. Torrey Club 25: 283. 1898, non L.; *R. salinus* A. Nels. op. cit. 549; Rydb. R. 231. 1922. Nux maior, ad 7 mm. longa. Valvae fructiferae ambitu cordato-orbiculares, longitudine interdum latiores.

In the list of specimens examined the names of the varieties are added.

Apart from the shape of the fruiting perigonium, the variability of *R. hymenosepalus* is inconsiderable. The leaves are flat or somewhat crisped. *Baker* 296 has broad and short leaves. The type specimen of *R. arizonicus* Britton has very gradually narrowed leaves. It has no ripe fruits, but on account of the locality it may belong to var. *salinus*. *Rumex arizonicus* may be, therefore, an older name for *R. hymenosepalus* var. *salinus*.

Explanation of Figure 9, b.—Rumex hymenosepalus Torr. Valves 4 times natural size. From *Jaeger* 908.

27. **Rumex densiflorus** Osterhout. Figure 9, *c*

Radice valida horizontali perennis (ex auctore). Caulis ± stricte erectus elatus 50–100 cm. altus, crasse fistulosus, flavescens vel pallide bruneus valde sulcato-striatus inflorescentia excepta non ramosus. Ochreae albidae hyalinae cito evanescentes. Folia basalia 30–40 cm. longa, 10–14 cm. lata, leviter undata vel fere plana, ambitu ovato- vel elliptico- vel oblongo-lanceolata, basi ± late cuneata vel oblique truncata raro rotundata, apice obtusiuscula vel saepius acuta, consistentia in vivo ut videtur carnosa, in sicco ± tenuiter papyracea, lamina in medio rarius infra medium latissima latitudine plerumque triplo longiora, utrinque glaberrima levis. Nervi laterales foliorum levissime arcuati vel fere recti, inferiores angulo ± 45° superiores angulo 70°–90° a mediano abeuntes. Petiolus foliorum basalium crassiusculus laminam longitudine subaequans. Folia caulina inferiora et media basalibus omnino similia sed sensim diminuta et multo brevius petiolata. Folia caulina superiora anguste ovato- vel oblongo-lanceolata, latitudine ca. 4-plo longiora. Axis inflorescentiae ± flexuosa. Rami inflorescentiae semper fasciculati, e basi arcuata ± stricte erecti vel subpatentes, paulo flexuosi,

breves vel elongati, inferiores iterum ramosi, paniculam angustam iam florendi tempore densiusculam fructificationis tempore compactam formantes. Florum glomeruli multiflori infimi ± remoti superiores approximati omnes foliis suffulcrantibus carentes. Inter pedicellos imprimis in glomerulis inferioribus hic illic ramulus brevis erectus vel ut pedicelli deflexus apice perigonia normalia proferens. Flores saepe purpureo-suffusi, antherae 1.8–2 mm. longae aureae. Pedicelli fructiferi tenuiter filiformes prope basin (in quarta circiter parte inferiore) insensibiliter articulati, perigonio fructifero (1–) 1.5 (–2) -plo longiores, basin perigonii versus paulo dilatati. Perigonii foliola exteriora anguste lineari-lanceolata ca. 2 mm. longa, basibus interiorum ± laxe accumbentia. Perigonii folia interiora (valvae) fructificationis tempore 5–6 mm. longa, 5–6 mm. lata, ambitu late rotundato-triangularis vel subcordata, basi late emarginata, apice breviter producta, acuta, margine imprimis basin versus crebre minute irregulariter eroso-denticulata, facie tenuiter sed prominenter reticulato-nervosa reticulo e maculis medianis rotundatis vel rhombicis isodiametricis marginalibusque valde elongatis composito; nervus medianus ceteris validior sed nunquam callifer. Consistentia valvarum maturarum papyraceo-membranacea, color carneo-bruneus, immaturarum flavescenti-viridis. Valvarum facies saepe minutissime impresso-punctulata. Nux matura atrobrunea, basi et apice fere aequaliter acuminata, ± 3 mm. longa, ± 2 mm. lata, in medio circiter latissima.

Synonymy: *R. densiflorus* Osterhout, Erythea 6: 13. 1898; Rydb. R. 231. 1922, excl. syn. *R. Bakeri* Greene.

Wyoming: North Park on edge of Wyoming (*Osterhout*, Ch, Wa; type). Centennial, Albany Co., banks of the river (*A. Nelson* 7711, Wa, Ke, La, Be; the two latter approach *R. pycnanthus* by the narrower valves). Big Creek Park, Hiltons Ranch (*Osterhout*, La). Medicine Bow Mts., Brooklyne Lake (*Mann* 170, La). Battle Lake (*A. Nelson* 4188, La). Battle, Carbon Co., continental divide, 3,000–3,300 meters (*Tweedy* 4392, Wa; no fr.). Rambler Ranger Station, Hayden Forest, Carbon Co., 2,700 meters (*Eggleston* 11307, Wa; no fr.). Copperton, 2,610 meters (*Tweedy* 4391, Wa; leaves shortly rounded or rather cordate at the base).

Colorado: Region of Gunnison Watershed, Kebler Pass, 3,000 meters (*Baker* 797, Ca, NY, Ke, Be, De, Z, MW). Cameron Pass, 3,000 meters (*Baker*, NY; no fr.). Near Pagosa Peak, 3,000 meters (*Baker* 297, Be). Little Kate Basin, La Plata Mts., 3,450 meters, common in swales (*Baker, Earle & Tracy* 641, La, Wa, Be, Ke, MW;

no fr.). Bob Creek, La Plata Mts., 3,000 meters (*Baker, Earle & Tracy* 270, Be, MW). Semi-meadow flats, summit of North Park Range, Routt Co. (*Goodding* 1819, Wa, Ca, Be, Bo; no fr.). La Plata Mts., 3,150 meters (*Tweedy* 513, Wa). Near Breckenridge, Mt. Guyot, 1,275 meters (*Anderson*, SL). Breckenridge (*Brandegee* 257, Ca). Deadman Canyon (*Colo. Agr. Coll.* 3842, NY; approaching in habit *R. praecox*). Tolland (*Ramaley* 9396, La). Vicinity of Georgetown (*Patterson*, Ch). Rocky Mts. (*Hall & Harbour* 158, Ch; midrib of the valves somewhat thickish!).

The four species *R. densiflorus* Osterhout, *R. pycnanthus* Rech. f., *R. orthoneurus* Rech. f., and *R. praecox* Rydb. agree so closely as regards the rhizome, some leaf characters, the extremely well-branched panicle, and the form of the fruiting perigonium that they could possibly be referred to one collective species. At present I prefer to maintain them as different species because I have been able to study sufficient material of only one of them, *R. densiflorus*. Of the other species I have seen one or very few sheets, often from the same collection, so that I can not decide how far the differential characters are individual or specific. The rather abundant material of *R. densiflorus* that I have studied from different states is, unfortunately, fruiting in only a few cases. I must call attention to the fact that among the specimens referred here to *R. densiflorus* there are some which in different respects agree with the other species. There is, for example, among the numerous sheets of *Nelson* 7711 a specimen which differs from the others by narrower, more acute valves, and approaches in this character *R. pycnanthus*. Several specimens of *R. densiflorus*, as *Colo. Agr. Coll.* 3842 and *Tweedy* 4391, differ from the type by shorter stems, little-branched panicle, and obtuse, relatively broad basal leaves, and approach in these characters *R. praecox*. The specimens cited by Rydberg, besides the type (*Baker, Earle & Tracy* 270), differ from the type (*Rydberg & Vreeland* 6328) by the taller stem, more branched panicle, and longer, more pointed leaves, and thus approach *R. densiflorus;* both numbers are without ripe fruits. *Tweedy* 4392 (Hb. Washington) recalls *R. orthoneurus* in that the lateral nerves of the basal leaves form nearly a right angle with the costa.

For the present I can not pronounce definite judgment on the taxonomy of the *Densiflori*, but I will mention certain facts that seem to be important for phylogeny.

In the summer of 1933 I discovered in the Eastern Bertiscus (North Albanian Alps) a new *Rumex* and published it (Mag. Bot.

Lapok 33: 5. *pl. 1.* 1934; Repert. Sp. Nov. 38: 371. 1935) as *R. balcanicus.* This *Rumex* agrees so well with *R. densiflorus* that it would be, if found in the Rockies, considered perhaps only a variety of that species. The differences lie almost entirely in the outline of the leaves, especially in the lamina being decurrent far along the petiole. Also the occurrence of *R. balcanicus* along subalpine rivers or near springs close to the timber line corresponds exactly with the American species. The discovery of such a similar species in a country so far away makes it probable that the subsection *Densiflori* is an ancient group, formerly widespread, now persistent as a relic in some restricted places in the Balkan Peninsula, but in the Rocky Mountains still in full development, as shown by the variability.

Some species with grainless fruiting perigonia, as the *Aquatici* or *R. domesticus* Hartm., are in some respects very similar to the *Densiflori,* but I consider, not these, but *R. alpinus* L., to be the next related. *R. alpinus* has a creeping rhizome such as the *Densiflori* seem to have; the *Aquatici,* on the contrary, have vertical roots. As the subterranean parts are usually not at all or very fragmentarily represented in herbarium specimens, this subject needs further study. In case my suggestion finds confirmation, the relatively large, obtuse, and partly cordate leaves of *R. praecox,* too, would be considered as an analogy to *R. alpinus.*

Explanation of Figure 9, c.—Valves of *Rumex densiflorus* Osterh., 4 times natural size, from *Nelson* 7711, Wyoming.

28. **Rumex pycnanthus** Rech. f.

Perennis. Caulis erectus 1–2 m. altus, 1–2 cm. crassus, validissimus, inferne strictus superne flexuosus, rufescens, profunde sulcato-canaliculatus, basi residuis petiolorum ochrearumque imbricato-tunicatus, infra inflorescentiam non ramosus. Ochreae albido-brunnescentes hyalinae. Folia basalia magna ampla, ad 40 cm. longa, ad 15 cm. lata, oblongo-ovata vel oblongo-lanceolata, latitudine 2–2.5-plo longiora, lamina infra medium latissima, leviter undata vel fere plana, basi oblique truncata et in petiolum breviter protracta vel late oblique cuneata, apice saepius obtusiuscula, consistentia in vivo ut videtur subcarnosa, in sicco ± tenuiter papyracea. Nervi secundarii foliorum a primario angulo ca. 70°–80° abeuntes vix arcuati fere recti. Petiolus foliorum basalium laminae longitudinem subaequans vel superans. Folia caulina non numerosa oblongo-ovata leviter undata, basi rotundata, apice acuta latitudine 2–3-plo longiora, ut folia basalia utrinque glabra et levia, sub lente tantum

minutissime punctulata breviter petiolata; petiolus latitudine folii brevior. Panicula fructifera ampla densa foliis omnino carens; axis inflorescentiae plerumque valde flexuosa. Rami inflorescentiae semper fasciculati terni vel quini, e basi arcuata flexuosi vel stricte erecti vel subpatentes; internodia infima ramorum valde elongata, superiora abbreviata. Florum glomeruli multiflori foliis suffulcrantibus carentes, in statu fructifero infimi remoti, superiores contigui; inter pedicellos imprimis in glomerulis inferioribus hic illic ramulus brevis erectus vel ut pedicelli deflexus apice perigonia normalia proferens. Pedicelli fructiferi tenuiter filiformes prope basin (in quarta circiter parte inferiore) insensibiliter articulati, perigonio maturo (1.5) 2–3-plo longiora, in basin perigonii subalato-dilatati. Perigonii foliola exteriora anguste linearia acuta, 2.5–3.5 mm. longa, basibus interiorum appressa eorumque dimidiam latitudinem semper manifeste superantia. Perigonii folia interiora (valvae) in statu fructifero 5–6 mm. longa, 3–4 mm. lata, ambitu anguste ovato- vel oblongo-triangularia, basi truncata, apice acuta, margine basin versus breviter acute denticulata ± rarius subintegra, consistentia tenuiter membranacea, colore pallide olivaceo-bruneo vel flavescente, facie tenuiter nervosa nervatura e pinnata in reticulatam transiente. Nervus medianus ceteris validior sed nunquam callifer. Nux matura brunea 3–3.5 mm. longa, ± 2 mm. lata, superne longius, inferne brevius acuminata, paulo infra medium latissima.

SYNONYMY: *R. pycnanthus* Rech. f. Repert. Sp. Nov. 38: 372. 1935. *R. subalpinus* Jones, Proc. Calif. Acad. II. 5: 720. 1895; Rydb. R. 231. 1922; Tidestrom 160. 1925; non *R. subalpinus* (Schur) Simonkai, Enum. Fl. Transsilv. 472. 1886.

UTAH: Brigham Peak, Marysvale, 3,450 meters (*Jones* 5957, Ca, Bo, La; type of *R. subalpinus* Jones; leaves short, rounded or slightly cordate at the base). Near head of Bullion Creek, above Marysvale, 3,300 meters (*Jones* 5893ai, Wa; type; valves acute, sharply denticulate but relatively broad).

R. pycnanthus is very similar to *R. densiflorus* Osterh. It differs from the latter especially by the narrower, acute valves, distinctly denticulate toward the base. As for the rest, see under *R. densiflorus*. The original name had to be changed because of an older homonym.

29. **Rumex orthoneurus** Rech. f. Figure 19

Perennis. Caulis erectus, inferne strictus superne subflexuosus, ad 1 m. vel ultra altus, crasse fistulosus pallide bruneo-virescens,

FIG. 19. *Rumex orthoneurus* Rech. f.

profunde sulcato-striatus, infra inflorescentiam non ramosus. Ochreae pallide bruneae evanescentes. Folia basalia (15–) 30–50 cm. longa, (4.5–) 9–14 cm. lata, plerumque plana, basi rotundata vel late cuneata, apice acuta, consistentia in vivo ut videtur carnosa, in sicco papyracea, lamina in medio circiter latissima latitudine plerumque 3.5–4-plo longior utrinque glaberrima laevis. Nervi secundarii foliorum recti, omnes fere angulo 90° a mediano abeuntes. Petiolus foliorum basalium crassiusculus laminam longitudine subaequans. Folia caulina inferiora et media basalibus similia sed sensim diminuta brevius petiolata, media infra medium latissima, superiora anguste lanceolata latitudine usque 6-plo longiora. Inflorescentia plerumque aphylla; rami inflorescentiae fasciculati terni usque quini subflexuosi erecti, inferiores elongati iterum ramosi, paniculam elongatam angustiusculam ± compactam formantes. Florum glomeruli multiflori, infimi tantum remoti, superiores approximati, omnes foliis suffulcrantibus carentes. Pedicelli fructiferi tenuiter filiformes in quarta circiter parte inferiora insensibiliter articulati, perigonio fructifero circiter 3-plo longiores. Perigonii foliola exteriora 1.5–1.7 mm. longa anguste lanceolata basibus interiorum appressa. Perigonii folia interiora (valvae) in statu fructifero 4 mm. longa et lata, ambitu rotundato-triangularia vel late ovato-rotundata, basi subtruncata vel late rotundata, apice acutiuscula vel obtusiuscula non producta, margine subintegra, facie indistinctius reticulato-nervosa; nervus medianus ceteris multo validior longitudinaliter incrassatus sed non callifer. Nux matura brunea, ca. 2.6 mm. longa, ca. 1.8 mm. lata, vix infra medium latissima.

SYNONYMY: *R. orthoneurus* Rech. f. Repert. Sp. Nov. 40: 294. 1936.

ARIZONA: Chiricahua Mts., Barfoot Park, rolling, andesitic pineland, recently lumbered, 2,400 meters (*Blumer* 1449, NY, Z, Ut, MW).

Rumex orthoneurus is very nearly related to *R. densiflorus* Osterh., from which it differs by the different proportion of fruits and pedicels, by the smaller fruiting perigonia with different outline, and by the nervation of the leaves. In *R. densiflorus* a longer, more robust secondary nerve alternates with a shorter and more slender one. In *R. orthoneurus* these differences are not so decided, so that the leaf seems to have double the number of lateral nerves. The lateral nerves form a right angle with the midrib. See also the discussion of *R. densiflorus*. This species is known from only one collection. Fragments of *R. orthoneurus* and *R. crispus* are mixed in all the sheets I have seen. The root fragments added in most of them do not seem to belong to *R. orthoneurus*.

Explanation of Figure 19.—Rumex orthoneurus Rech. f., half natural size; Arizona, *Blumer* 1449; basal leaf added.

30. **Rumex praecox** Rydb. Figure 20

Perennis; rhizoma crassum horizontale. Caulis erectus, 20–30 cm. altus, striato-sulcatus. Folia basalia ovata vel elliptica basi rotundata vel late cuneata, apice rotundata, parva, ad 6 cm. longa, 2.5–3 cm. lata, in sicco papyracea, glabra et levia, nervi secundarii angulo ca. 45° a primario abeuntes. Petioli foliorum basalium lamina 1.5–2-plo longiores. Folia caulina basalibus similia, sensim minora et praecipue multo brevius petiolata, omnia obtusa, superiora longitudine usque 3-plo longiora. Inflorescentia iam in primo nodo supra basin incipiens, subelongata, angusta, laxiuscula. Florum glomeruli inferiores remoti, superiores approximati, omnes aphylli. Pedicelli filiformes, infra medium indistincte articulati. Perigonii foliola exteriora 2–3 mm. longa, ovata. Perigonii folia interiora (valvae) in statu immaturo ad 5 mm. longa, ovata, integra, ecallosa. Nux submatura ad 3 mm. longa.

SYNONYMY: *R. praecox* Rydb. Bull. Torrey Club 33: 137. 1906; Rydb. R. 231. 1922.

COLORADO: Grayback Mining Camp (*Rydberg & Vreeland* 6328, NY; type).

The second specimen cited by Rydberg differs considerably in vegetative characters, so that I place it under *R. densiflorus.* For relationship with other species, see the discussion of *R. densiflorus* Osterh.

Explanation of Figure 20.—Rumex praecox Rydb., half natural size; *Rydberg & Vreeland* 6328, type.

31. **Rumex alpinus** L.

Rootstock creeping; stems thick, upright; fruiting panicle much branched, compact; basal leaves large, usually only 1–1.5 times as long as broad, broadly rounded at the apex, deeply and broadly cordate at the base; pedicels filiform, about 3 times longer than the fruit, jointed below the middle; valves ovate, 4–6 mm. long, 4–5 mm. broad, cordate at the base, acute, without any callosity.

SYNONYMY: L. Sp. Pl. 334. 1753; Fernald, Rhodora 23: 107. 1921.

Originally from the mountains of Europe and Western Asia. Found only once, as introduced, in America.

NOVA SCOTIA: Yarmouth Co., springy fields and swales, Rockville (*Fernald & Long* 21052, O).

32. **Rumex domesticus** Hartm.

Perennial; stems strict, upright; basal leaves oblong-ovate or broadly lanceolate, narrowed or rounded at the base, more or less crisped; fruiting panicle compact; pedicels to 2.5 times as long as the fruit, jointed below the middle; valves reniform-rounded, deeply cordate, entire or nearly so, all without a grain or rarely one of them with a very small, globular suggestion of a callosity.

SYNONYMY: Hartm. Scand. Fl. ed. 1. 148. 1820; Murbeck, Bot. Notiser 1899: 13. 1899.

NEWFOUNDLAND: Torbay, moist place in pasture (*C. D. Howe* 1283a, Lu). Irishtown, Bay of Islands (*Waghorne*, Z).

NEW BRUNSWICK: St. Andrews (*Fowler*, Wa).

NOVA SCOTIA: Louisburg, Cape Breton Isl. (*Macoun* 20215, O). Barrington Passage (*Macoun*, O). Ball's Island (*Macoun* 83946, O). About houses and in fields, Boylston (*Hamilton* 26675, O).

ALASKA: Juneau (*Hultén* 8291, Lu; *Anderson* 430, NY). Karluk, common in bogs and brooks (*Horne*, NY; uncertain, leaves only). Unalaska (*Hultén* 7532a, Lu). Umnak Isl., Nikolski (*Hultén* 7110, Lu; uncertain, leaves only).

MAINE: South Bristol (*Wilson*, NY).

WISCONSIN: Madison (*Shaw School*, Ko; *Trelease*, Lu).

This species has its principal area in the north of Europe, but it occurs also in an apparently spontaneous state in the eastern Pyrenees. I saw one specimen from high Asia and one from eastern Asia, which may belong to the same or a very nearly related species. American specimens mentioned below are in no way different from the North-European. American botanists should try to discover whether this species is indigenous in the New World. Its distribution in North America—Eastern Canada and Alaska with adjacent islands—suggests that it may be so. The Wisconsin specimen may be introduced in any case. Compare the discussion of *R. pallidus* and *R. fenestratus*.

33. **Rumex occidentalis** Wats. Figure 9, *d*

Perennis. Caulis stricte erectus, humilis vel elatus, gracilis vel validus, internodiis inferioribus et mediis plerumque elongatis, tenuiter sulcato-striatus, rufescens vel purpureo-suffusus, 50–150 cm. altus, infra inflorescentiam non ramosus. Ochreae pallide bruneae tenuiter membranaceae cito evanescentes. Folia basalia e basi ± profunde cordata oblongo- vel ovato-triangularia apice acuta

FIG. 20. *Rumex praecox* Rydb.

vel obtusiuscula, plana vel leviter undata, parva vel ampla, latitudine 2–2.5-plo longiora, in quarta circiter parte inferiore latissima, consistentia in sicco ± tenuiter papyraceo-membranacea, utrinque glabra et levia. Nervi secundarii a mediano angulo ca. 45°–60° abeuntes, arcuati. Petiolus foliorum basalium lamina ca. quarta vel tertia parte brevior vel eam subaequans. Folia caulina e basi profunde cordata oblongo-triangularia, latitudine ca. 2–5-plo longiora, ± undata, apice acuta prope basin latissima, brevius petiolata ut folia basalia glabra et levia, sub lente tantum minutissime punctulata. Rami inflorescentiae arcuati vel ± stricte erecti, breves, singuli vel infimi paulum elongati bini ternive, inflorescentiam ± angustam fructificationis tempore compactam strictam elongatam, rarius abbreviatam subaphyllam formantes. Florum glomeruli multiflori, foliis suffulcrantibus carentes, omnes approximati, in statu fructifero contigui. Perigoniorum fructiferorum pedicelli tenuiter filiformes, in quarta vel quinta parte inferiore insensibiliter articulati, in basin perigonii breviter infundibuliformi-dilatati, perigonio fructifero 1.5–2-plo longiores. Perigonii foliola exteriora lineari-lanceolata, ca. 2 mm. longa, basibus interiorum accumbentia. Perigonii folia interiora (valvae) in statu maturo 4–5 mm. longa, 5–6 mm. lata, ambitu cordato- vel rotundato-triangularia, basi late leviterque emarginata vel fere truncata, apice acuta non vel vix producta, margine subintegra vel saepius minutissime irregulariterque eroso- vel crenulato-denticulata, colore fusco-bruneo-rufescente, consistentia tenuiter membranacea. Valvae semper omnino ecallosae, facie tenuiter elevate reticulato-nervosae, reticulo subaequali, maculis omnibus elliptico- vel rotundato-rhombicis, marginalibus subminoribus, non vel vix elongatis; nervus medianus ceteris validior. Nux matura atrofusca, 3 mm. longa ± 1.5 mm. lata, apice sublongius, basi brevius acuminata, paulo infra medium latissima.

SYNONYMY: *R. aquaticus* Pursh 248. 1816, non L.; Campdera 101. 1819, p.p.; Meisn. apud DC. 43. 1856, p.p. *R. domesticus* Hook. 129. 1840, p.p. excl. *β nanus*, non Hartm. *R. occidentalis* Wats. Proc. Amer. Acad. 12: 253. 1877; Wats. 8. 1880; Coult. 317. 1885; Macoun 415. 1883; Trelease 81. 1892; Britt. & Brown 550. 1896; Piper 225. 1906; Gray 355. 1908; Woot. & Standl. 192. 1915; Rydb. R. 231. 1922; Jepson 292. 1922; Tidestrom 160. 1925; Rydb. P. 279. 1932. *R. polyrhizus* Greene, Pittonia 4: 305. 1901. *R. Bakeri* Greene, Pl. Baker. 3: 15. 1901. *R. gracilipes* Greene, Pittonia 4: 304. 1899–1901. (?)*R. elongatus* Gray 355. 1908, non Guss. (?)*R. longifolius* Meisn. apud DC. 44. 1856, non DC.

ILLUSTRATIONS: Trelease 1892, *pl. 19;* Britt. & Brown 550. 1895.

DISTRIBUTION: Nearly all Canada and western United States.

QUEBEC: Swamps, Salt Lake, Anticosti (*Macoun* 23728, O).

LABRADOR: Saguenay Co., shore of bay, Petite Rivière Coxipi Bronague (*H. St. John* 90398, O; no fr.).

ONTARIO: Twenty-five miles north of Ft. Albany, James Bay (*Wilson* 53963, O; no fr.). Lake Nipigon, low ground 50° N. (*Macoun* 23732, O; approaching *R. arcticus* in habit and form of leaves).

MANITOBA: In a boggy place, southwest of Brandon (*Macoun* 12847, O). Swamps and boggy meadows, Lake Winnipegosis, ca. 52° N. (*Macoun* 23731, O; slender, not ramified). Winnipeg Valley (*Bourgeau,* Be). Fort Churchill, Hudson Bay (*R. Ball* 23721, O; in habit near *R. arcticus,* but base of leaves cordate). Churchill (*Macoun* 79396, O; no fr.; possibly *R. fenestratus;* poor ramification).

SASKATCHEWAN: Saskatchewan Plains (*Macoun* 1272, Ke; like *Macoun* 23731 and 23721). Low ground, Moose Mt. Lake (*Macoun* 23733, O; no fr.). Low ground, Cypress Hills (*Macoun* 23725, O). Near Manitou Lake, along line of Grand Trunk Pac. Railway (*Macoun & Herriot* 76819, O). Les Coulées, abundant (*Bourgeau,* Ke; valves larger, more triangular).

ALBERTA: Vicinity of Banff, wet ground along Bow River, 1,350 meters (*McCalla* 2398, Ke; leaves narrow, not cordate). Wet, boggy places, Sand Hills (*Macoun* 23724, O). Wet places along . . . Cardston(?) (*Macoun* 12911, O; valves larger, more triangular). Rocky Mts., low ground, Kicking Horse Lake (*Macoun* 23729, O). Headwaters of Saskatchewan and Athabasca rivers (*S. Brown* 1528, NY; mixed with *R. paucifolius*). Marshes near Sulphur Spring, Crow Nest Pass (*Macoun* 24673, O; poor ramification, habit of *R. domesticus*).

BRITISH COLUMBIA: (*Rothrock* 62, Ch). Vicinity of Sidney (*Macoun* 87955, O; perhaps *R. occidentalis* × *fenestratus?;* valves different in size; nutlets sterile).

YUKON: Second island in Klondike River (*Macoun* 91294, O; approaching *R. fenestratus*).

ARCTIC NORTH AMERICA: Franklin Exped. (*Richardson* 23727, O).

NORTH DAKOTA: Butte, Benson Co., in ravine (*Lunell,* Wa, La).

SOUTH DAKOTA: Spearfish Canyon, stream side, with *Quercus, Salix, Populus* (*Hayward,* NY). Bank of Little Spearfish Creek (*Murdoch,* Ch).

MONTANA: Sedan, Gallatin Co., east of Flathead (*W. W. Jones*, Ca). Swampy ground near Bozeman, 1,350 meters (*Blankinship* 454, Wa, Ch, Be, St). Along Swiftcurrent Creek, below Lake McDermot, 1,350 meters, boggy meadow (*Standley* 16875, Wa). Vicinity of St. Mary Chalets, foot of St. Mary Lake, 1,350 meters, wet thicket (*Standley* 17391, Wa). Davaher Ranch, Flathead National Forest (*Kirkwood* 2396, Ca; stem short, little ramified; thick, leathery basal leaves, the nerves of the upper surface immersed). Billings (*C. M. Patten*, Ch).

WYOMING: Yellowstone Park, Swan Lake Flat (*Mearns* 293, Wa). Gibbon Canyon, wet ground (*A. & E. Nelson* 6751, Wa). Yellowstone Park (*Mearns* 3018, Wa). Tower Fall Ranger Station, 1,860 meters (*Conard*, St). Teton Forest, 2,400 meters (*Tweedy* 472, NY). Sherman (*Greene*, photo. in hb. MW; type of *R. polyrhizus* Greene). Big Horn Mts., headwaters of Clear Creek and Crazy Woman River (*Tweedy* 3272, P). Jaw Bone Gulch (*Nelson*, La; by larger valves approaching *R. fenestratus*).

COLORADO: Gunnison, 2,300 meters (*C. F. Baker* 903, Wa, Ca, La, SL, NY, Ke, MW; type of *R. Bakeri* Greene). Gunnison (*Shear* 5073, Wa). Mountain View, 2,900 meters (*Clements* 395, La, Ko; mixed with *R. fenestratus;* Wa, Be). Without locality (*Engelmann*, Be). Fort Collins, 1,500 meters (*Towson*, La). Vicinity of Georgetown, banks of Clear Creek (*Patterson*, Ch).

NEW MEXICO: Fort Wingate (*Matthews*, Be). Mogollon Mountains, Socorro Co., Middle Fork of the Gila (*Wooton*, Wa). Vicinity of Brazos Canyon, Rio Arriba Co., swamp (*Standley & Bollman* 11026, Wa). Weleber's Cattle Camp, Rio Fernandez de Taos Canyon, Carson Forest, Taos Co., 2,700 meters (*Eggleston* 19279, NY).

TEXAS: Dallas (*J. Ball*, De; strange habit, stem very tall and stout, upper leaves long and crisped).

IDAHO: About Forest, Nez Perce Co., 1,050 meters (Heller 2481, Z; approaching *R. fenestratus*).

UTAH: Fish Lake, 2,700 meters (*Jones* 5784, Wa, Ca). Fish Lake, around Twin Creeks (*Rydberg & Carlton* 7493?, Wa). Rabbit Valley, 2,040 meters (*L. F. Ward* 411, Wa).

WASHINGTON: Rock Island, Kittitas Co., 1,850 meters (*Sandberg & Leiberg* 447, Be, approaching *R. fenestratus;* Le).

OREGON: River bottoms (*Howell*, Be, Bu; approaching *R. fenestratus*). Near Crow Creek, Wallowa Co. (*Sheldon* 8497, Wa; perhaps *R. fenestratus*).

NEVADA: Pine Creek, High Ranch (*Greene*, photo. MW; type of *R. gracilipes* Greene). Toiyabe Forest, 1,800–2,400 meters, Big Creek, Kingston Canyon, meadow (*Hitchcock* 817, Wa).

CALIFORNIA: Goose Lake (*R. M. Austin* 419, Wa). Santa Barbara (*Elmer* 3932, MW). Fall River Lake, Shasta Co. (*Baker*, Ca; approaching *R. fenestratus*). Mt. Shasta, Siskiyou Co., meadow at Sisson, 1,050 meters (*Hall & Babcock* 4065, Ca).

LOCALITY INDEFINITE: Rocky Mts., Lat. 39°–41° (*Hall & Harbour* 499, De, Bo; leaves small, scarcely cordate, panicle rather sparsely branched).

Rumex occidentalis is highly variable as regards the size, thickness of stem, ramification of inflorescence, and, especially, form of leaves. Also the size and outline of the valves and the size of the nutlets are variable. The demarcation of this species and the question whether it is a unit or whether certain combinations of characters may be selected as indicating separate types must be closely examined.

Species of *Lapathum* with perennial, vertical roots, without axillary branches, with leaves cordate at the base, and with grainless, entire valves (subsect. *Aquatici*) are rather closely dispersed over the temperate zone of the northern hemisphere so far as the considerable need for humidity of this group of species is fulfilled. As in this group neither grains nor dentation of the border of the valves ever develop, it is clear that all these forms have a homogeneous stamp as to the formation of the fruits, in contrast to the variability of the vegetative organs. This unity goes so far that the inclusion of all these forms in one collective species could be defended. This collective species would have to bear the name *Rumex aquaticus* L. as the oldest, in an extended sense. Actually the older authors as, for instance, Pursh, Campdera, and Meisner, did not detect a difference between the Old World and the New World representatives of the *Aquatici*, but these authors had not well defined their *Rumex aquaticus* and had included a lot of elements belonging to other groups of species. This uncertainty arises concerning the North American *Aquatici* by the appearance in the older American literature of representatives of *Aquatici* at the same time under the names of *R. aquaticus*, *R. domesticus*, and *R. longifolius*. Watson is the first who makes a separating line between the representatives of the Old and the New World *Aquatici* by creating his *R. occidentalis*.

The extraordinary variability of *R. occidentalis* was not considered by Trelease in the first synoptical account of the American *Rumex* species, but he recognized the close relationship of *R. arcticus* to *R. occidentalis* by placing Hooker's *R. domesticus* var. *nanus* near *R. occidentalis*. It was reserved to Greene to describe six further species of the relationship of *R. occidentalis*. If in this work only two of them appear and that in an altered sense (*R. fenestratus* and *R. fenestratus* var. *procerus*), it does not detract from that author's sharp power of observation, but only emphasizes the lack of critical weighing, which is occasionally to be found in his works.

My present attempt at interpretation of the American *Aquatici* is based on the following observations. The widest range is occupied by forms with an average length and breadth of the valves of 5 mm.; that is, from New England in the east to Montana (and occasionally still farther) in the west and in the Rocky Mountains south to New Mexico. In the west this area is joined by a zone exclusively or at least prevailingly inhabited by forms with large fruits, the valves averaging 9 mm. in size. The distribution of these large-fruited forms is from western middle California in the south to Alaska in the north, with especially abundant occurrence in the northwestern United States and southwestern Canada (Vancouver Island). There are wide interruptions in the ranges of these forms in northwestern Canada.

In a surprising way, forms with large fruits appear also on the easternmost edge (Labrador) of the continent, differing only slightly from the western by a more triangular-acute form of the valves. This fact deserves special consideration in a phytogeographic respect, since it shows analogies in other subsections: among the *Salicifolii* the appearance of the east-American *R. pallidus* Bigel. in Alaska; among the *Maritimi*, the appearance of the likewise east-American *R. persicarioides* L. sensu St. John in California and Oregon; further the appearance of *R. domesticus* Hartm. in eastern Canada and Alaska, but whether it is wholly indigenous, it must be admitted, is open to question. I unite the *Aquatici* with small fruits under the name *R. occidentalis*, without regard to whether they have tall or low, stout or slender, little- or much-branched stems, long or short, broad or narrow, distinctly or not distinctly (or occasionally not at all) cordate leaves, and long or short petioles, since all these characters apparently neither parallel each other nor are limited to certain regions, but in a high degree depend on such circumstances as humidity, elevation above sea level, etc.

With increasing elevation above sea level the stem becomes usually more delicate, lower, and less branched, just as in more northern countries. At the same time the leaves become narrower and less distinctly cordate. This last modification seems to appear also when humidity is considerable.

In some cases it is not easy to distinguish *R. arcticus* from forms of *R. occidentalis* of extreme situations. *R. arcticus* is distinguished from these by small leaves which have a thick consistency, by a succulent and more flexuous stem, by thick and not very distinct nerves of the valves, and by an often very intense red color of the whole plant, even when the base of the leaves of *R. arcticus* is occasionally a little cordate.

The forms with large fruits I unite under the name *R. fenestratus* Greene (originally described from Vancouver Island). *R. confinis* Greene from Idaho I must reduce to synonymy. *R. procerus* Greene I add as a variety to *R. fenestratus;* it occupies the most southern stations that lie remarkably low for these latitudes, and is characterized by an especially tall and robust habit. I have had to create a new name for the Labrador plant mentioned before, with large fruits and acute valves, and call it *R. fenestratus* var. *labradoricus.* The other species of *Aquatici* created by Greene I have reduced to synonymy under *R. occidentalis.*

Explanation of Figure 9, d.—Valves of *Rumex occidentalis* Wats., 4 times natural size, Winnipeg Valley, *Bourgeau.*

34. **Rumex arcticus** Trautv. Figure 21

Radix perennis crassa. Basis caulis rudimentis emarcidis petiolorum et ochrearum imbricato-tunicata. Caulis humilis simplex—inflorescentia tantum interdum breviter pauciramosa—stricte erectus vel subflexuosus, paucifolius, 10–40 cm. altus, crebre tenuiter sulcato-striatus, saepe purpureo-suffusus. Ochreae bruneae evanescentes. Folia basalia parva ca. 6–12 cm. longa, 2–3 cm. lata, utrinque ut tota planta omnino glabra et levia, in vivo ut videtur carnosa, in sicco coriacea vel crasse membranacea, plana vel leviter undata, margine saepe crispata, ambitu ovato-lanceolata vel oblongo-lanceolata, basi leviter cordata vel truncata vel ± late cuneata, saepe paulo obliqua, apice obtusiuscula vel acuta, longitudine 3–5-plo longiora, infra medium latissima. Nervi laterales foliorum saepe vix conspicui, angulo valde variabili (ca. 40° usque fere 90°) a mediano abeuntes. Petiolus foliorum basalium lamina plerumque ⅓–½ brevior, rarius eam subaequans. Folia caulina inferiora basalibus subsimilia sed

proportione minora angustiora brevius petiolata; folia caulina superiora saepe anguste lineari-lanceolata, latitudine 6–8-plo longiora. Rami inflorescentiae—si evoluti—tenues breves arcuato-divergentes flexuosi, paniculam parvam laxiusculam foliis omnino fere carentem formantes. Florum glomeruli saepe depauperati, rarius multiflori, in statu florendi ± approximati, in statu fructifero ± remoti. Pedicelli fructiferi filiformes, in tertia vel quarta parte inferiore insensibiliter articulati, basin perigonii versus sensim subalato-dilatati, perigonio maturo ca. 1–2-plo longiores. Perigonii foliola exteriora basi late connata, ovato-lanceolata, obtusiuscula vel subacuta, 1.5–2 mm. longa, basibus interiorum arcte appressa. Perigonii folia interiora (valvae) in statu fructifero ca. 4–5 mm. longa, 3–4 mm. lata, ambitu ovata, consistentia tenuiuscule membranacea, colore brunea vel purpureo-suffusa, basi rotundata apice obtusa vel acutiuscula, margine subintegra, facie tenuiter et subaequaliter reticulato-nervosa, nervo mediano ceteris validiore sed minime quidem callifero. Nux matura atrobrunea ca. 2 mm. longa, ca. 1.3 mm. lata, basi breviter, apice longius acuminata, infra medium latissima.

SYNONYMY: *R. arcticus* Trautv. in Middendorff, Reise Sibir. 1, pt. 2: 29. 1856; Murbeck, Bot. Notiser 234: 1917; Hultén, Fl. Kamtchatka in Svensk. Vet. Akad. Handl. III. 5, No. 2: 45. 1928. *R. domesticus β nanus* Hook. 129. 1840. *R. occidentalis* var. *nanus* Trelease 82. 1892. *R. longifolius β nanus* Meisn. apud DC. 44. 1856.

DISTRIBUTION: Arctic-circumpolar.

CANADA: Yukon, Gold River Creek (*Macoun* 91292, NY). Gold Run Creek (*Macoun* 91292, O). South coast of Coronation Gulf, Tree River (*Cox & O'Neill* 416, O). Mouth of Mackenzie River, shore of Mackenzie Bay (*Stringer* 15953, O; branched; leaves truncate at base). King Point, 69° 7′ N. Lat., 137° 40′ W. Long. (*G. Jansen*, Ko). Bathurst Inlet, 67°–68° N. Lat., 109°–111° W. Long. Arctic Sound (*E. M. Anderson* 468, 469, O). Herschell Isl., Yukon, 69° 35′ N. Lat., 139° W. Long. (*F. Johansen* 229, Ko, O; panicles branched).

ALASKA: Yukon District (*F. Anderson*, St). Vicinity of Norton Sound, north of Nome (*Rhodes*, Ca; not branched; stem 60 cm. high; most leaves suddenly narrowed). Port Clarence (*Kjellman*, St). St. Michael (*Setchell*, Ca). Shishmaref Inlet, near Kotzebue Sound (*Chamisso*, Be). Survey Camp No. 1, Kotzebue (*W. E. B.*, Ca). Nome (*Piper*, P; *Blaisdell*, Ca). McKinley National Park, head of Savage River, narrow valley between high mountains, along stream-overflowed islet, 1,000 meters (*Ynes Mexia* 2048, Ca; lower leaves broad and short but not cordate). McKinley National Park near

FIG. 21. *Rumex arcticus* Trautv.

center of north boundary, 700 meters, slopes west of Wonder Park (*Mexia* 2244, Ca, St; little-branched). St. Lawrence Island (*Kjellman*, St). Nunivak Island, damp ground (*Macoun* 24490, O). Kussiloff (*Evans* 694, Wa; stem to 70 cm. high; panicle branched).

LOCALITY UNCERTAIN: "Northwest America" (*Seemann* 1798, Ke).

Rumex arcticus is characterized by its short, somewhat stout or succulent stem, almost simple inflorescence (rarely with a few short, slender and flexuous branches), and small, somewhat thick basal leaves, almost cuneate at the base. The whole plant, or at least the stem and fruits, is often purple. Specimens doubtful in one or another respect, showing not all the characters together, are known from Canada and Alaska. Since the material available is poor and mostly incomplete, I can not decide whether these specimens should be considered as connecting forms between *R. occidentalis* and *R. arcticus* at the limit of their areas or as hybrids. The geographic distribution of this species is arctic-circumpolar, the only example of this type of distribution in the subgenus *Lapathum*.

Explanation of Figure 21.—Rumex arcticus Trautv., half natural size: (*a*) habit, Alaska, *Mexia* 2048; (*b*) basal leaf, Canada, *Anderson* 468; (*c*) basal leaf, Canada, *Stringer* 15953; (*d*) basal leaf, Canada, *Cox & O'Neill* 416. Valves 4 times natural size, from *Stringer* 15935.

35. **Rumex fenestratus** Greene. Figure 22, *a*

Perennis. Caulis stricte erectus saepe valde elatus interdum plusquam 2 m. altus pallide roseo-flavescens (color rhei), sulcato-striatus, inflorescentia excepta non ramosus. Ochreae pallidae hyalinae cito evanescentes. Folia basalia in sicco tenuiter vel crasse papyraceo-membranacea, magna (ex auctore ad 15 cm. lata) latitudine ca. 2-plo longiora, supra basin latissima, basi profunde cordata, apice acuta vel acutiuscula, ambitu ovato- vel oblongo-ovato-triangularia, leviter vel valde undato-crispata vel fere plana, subtus imprimis ad nervos cum petiolis saepe papilloso-scabra; nervi secundarii a mediano angulo ca. 70°–90° abeuntes, demum prorsus curvati. Petioli foliorum basalium laminae longitudinem fere aequantes. Folia caulina e basi profunde cordata oblongo-triangularia, apice acuta, latitudine plerumque plusquam triplo longiora, supra basin latissima, leviter undata, breviter petiolata, levia, sub lente tantum minute papilloso-punctulata. Panicula ampla densiuscula; axis inflorescentiae saepe ± flexuosa; rami singuli rarius bini ternive, inferiores partim iterum ramosi ± elongati, superiores breves simplices vel breviter ramosi, omnes tenues subflexuosi, erecto-patentes vel leviter arcuati. Florum

FIG. 22. Valves of (a) *Rumex fenestratus* Greene, (b) *R. Britannica* L., (c) *R. fueginus* var. *athrix* (St. John) Rech. f., (d) *R. fueginus* var. *brachythrix* Rech. f., (e) *R. fueginus* var. *ovato-cordatus* Rech. f., (f) *R. fueginus* var. *tanythrix* Rech. f., (g) *R. fueginus* form.

glomeruli multiflori, foliis suffulcrantibus carentes, in statu fructifero contigui, perigoniorum fructiferorum pedicelli tenuiter filiformes, perigonio maturo ± 1.5-plo longiores, in tertia vel quarta parte inferiore insensibiliter articulati, in basin perigonii breviter infundibuliformi-dilatati. Perigonii foliola exteriora anguste lineari-lanceolata, ca. 3 mm. longa, emarginationi interiorum accumbentia. Perigonii folia interiora (valvae) in statu fructifero 10 mm. longa, 7–9 mm. lata, ambitu rotundato-cordata basi ± profunde emarginata, apice acutiuscula vel rotundato-acuminata, nunquam producta, margine subintegra vel saepius—imprimis basin versus—minutissime irregulariterque erosulo-denticulata, colore pallide carneo-bruneo, consistentia tenuiter membranacea. Valvae semper omnino ecallosae, facie tenuiter elevate reticulato-nervosae, reticulo aequali maculis marginalibus minoribus non vel vix elongatis; nervus medianus ceteris validior. Nux (non perfecte matura) fusca 3.5–4 mm. longa, ca. 2 mm. lata, utrinque fere aequaliter acuminata, paulo infra medium latissima.

SYNONYMY: *R. fenestratus* Greene, Pittonia 4: 306. 1901. *R. confinis* Greene, Pittonia 4: 306. 1901; Rydb. R. 231. 1922, non Hausskn. Mitt. Geogr. Ges. Thuer. 3: 77. 1885. *R. occidentalis* auctorum amer. bor. occid. p.p.

DISTRIBUTION: Alaska to northwestern United States and northeastern Canada.

LABRADOR: (Var. *labr.*). Straits of Belle Isle, marshy belt behind the strand, Blanc Sablon (*Fernald & Wiegand* 3288, O, Ke).

QUEBEC: (Var. *labr.*). Ile d'Anticosti, Lac Salé, dans la prairie naturelle (*Marie-Victorin & Rolland-Germain* 27339, 27151, St). Garden at Ceravalla Bay, Lake Melville, common (*Wetmore* 102933; no ripe fr.). Shores of Naskanpi River, Grand Lake, Lake Melville Distr., common (*Wetmore* 102934, O; no ripe fr.).

BRITISH COLUMBIA: Swampy places, Agossing (*Macoun* 23726, O). Swampy places, Sproat(?) (*Macoun* 23730, O). Dead Man's River (*Anderson*, P). Without locality (*Rothrock* 62, NY). Vancouver Island, Sidney (*Macoun* 83944, O). Vicinity of Nanaimo (*Macoun* 83942 Ch, O, Be). Colginty River (*Macoun* 83943, O). Salt marshes, Chase River near Nanaimo (*Macoun*, O). Vicinity of Ucleulet (*Macoun* 83941, O). Salt marshes, Comax (*Macoun* 1570, O; type).

ALASKA: Rodman Bay, Baranoff (*Stephans* 106, Ca). Open places, shores of Behm Canal (*Gorman*, Ca). Juneau, near beach (*J. P. Anderson* 2A-215, Lu). King Cove (*Eyerdam* 1735, Lu; no ripe fr.).

River bottom, Kelp Bay; Baranoff Isl. (*Walker* 795, Ca, St; no ripe fr.). Matanuska, wet roadside (*Anderson* 891, MW; 1040, Lu; no ripe fr.). Vicinity of Karluk, Kodiak Isl. (*Rutter* 75, St, Ko; no ripe fr.). Kodiak, Sitkalidak Isl., Port Hobron (*Eyerdam* 189, Lu). Jakobi Island (*Anderson* 1358, Ch). Unalaska (*Eyerdam* 2486, 2450, Lu; *Hultén* 7654, Lu). Makuslin Bay, Unalaska, along stream (*E. C. van Dyke* 183, G; no ripe fr.). Unimak Isl., False Pass (*Eyerdam* 2222, 2233, Lu; no ripe fr.). Akutan (*Norberg* 429, Lu; no ripe fr.). Umnak Isl., Nikolski (*Hultén* 7110, Lu; no ripe fr.). Amlia Isl. (*Eyerdam* 1187, Lu; leaves only). Attu (*Hultén* 6122, Lu; leaves only).

MONTANA: Ronan, 900 meters, Middle Temperature Life Zone (*M. E. Jones*, G; no fr.). Libby Creek (*Blankinship*, SL).

IDAHO: Corral, Camas Prairie, thicket edge, 1,710 meters (*Macbride & Payson* 3812, NY, Wa, Ca, UW). Wet meadows around Lake Pend d'Oreille (*Leiberg* 562, SL, Lu; type of *R. confinis* Greene). Bitter Root (*Sandberg*, Ch). Coopers(?) (*A. I. Mulford*, SL). Moist and wet places along Paradise Creek, common (*Henderson*, Wa). Moscow, Latah Co. (*Abrams* 728, Ca; no fr.). Common in wet copses, valley of Big Potlatch River, Nez Perce Co. (*Sandberg, etc.* 364, Ke). Common along Green Horn Creek near Hailey (*Tidestrom* 2753, Wa; no fr.).

WASHINGTON: Kittitas Co., 185 meters (*Sandberg & Leiberg* 447, Ca). Rock Island, Kittitas Co. (*Sandberg & Leiberg* 447, P, Wa). Loon Lake, Stevens Co. (*Turesson*, Lu; no fr.). Yakima Region, Triton(?) Basin (*Brandegee*, Ca). Seattle (*Piper*, Ch, MW; *Mosier*, Wa). Hoquiam (*E. M. Bardell*, SL; no fr.). Edge of lake near Evergreen trail, Quiniault (*Conard* 226, P, Wa). Western Klickitat Co., bottom lands, Columbia River (*Suksdorf* 1401, P, Ch, Ca). Hoquiam (*Cowles* 543, Ch). Base of Mt. Carleton (*Kreager* 300, P). Cattle Point, San Juan Islands (*Peck* 12719, P). Wilson Creek (*Lake & Hull*, P). Rock Lake, Whitman Co. (*Weitman* 154, P). Pullman (*Piper* 1548, P).

OREGON: Portland (*Henderson*, P). Portland, Lower Albina (*Sheldon* P, Ch, Wa). Wet meadow on Red Blanket Creek, near Prospect, 1,050 meters (*Applegate* 2552, Wa; no fr.). Ross Slough, Coos Co. (*H. H. Smith* 3680, Ca; no fr.). Vicinity of Laidlaw, Crook Co. (*Whited*, Wa; no fr.). Big Sheep Creek, Wallowa Co., 1,410 meters (*Sheldon* 8616, SL). Shore of Klamath Lake, near Modoc Point (*Coville* 1332, Wa; no fr.). Silver Lake to Ft. Klamath (*Furlong, etc.*, Ca; no fr.). Klamath Indian Reservation, Valley of

Sprague River (*Coville* 1319, Wa). Hood River (?, Ca; no fr.). Western Oregon, river bottoms (*Howell*, Be, UW; no fr.). Klamath Co., south of Beaver Marsh, Crescent (*Abrams* 9671, La). Yaquina Head, Lincoln Co. (*J. C. Nelson* 410, P). Sauvies Island (*Howell*, P).

CALIFORNIA: Lassen Co., Amadee (*B. Davy*, Ca). Amadee, Honey Lake Valley (*B. Davy*, Ca; *proc.*). San Francisco (*Andersson*, St; *proc.;* leaves only). Lake Merced, San Francisco (*Eastwood*, Ch). Coloma (*Andersson*, St; *proc.*). Goodyear, Solano Co., common in marshes (*Baker* 3219, MW, photo.; type of *R. procerus* Greene). Northern Coast Ranges, brackish marsh near Samoa, 0–150 meters (*Tracy* 3148, Ca; *proc.*). Along streamlet, Bold Mt. between High Prairie and Snow Camp, Humboldt Co., 1,050 meters (*Tracy* 4578, Ca; no fr.). Berkeley, marshes (*B. Davy* 722, Ca; *proc.*). Warner Mts., Modoc Co., 2,190 meters, meadows, head of North Fork, Parker Co. (*Taylor & Bryant*, Ca; no fr.). Willow Creek (*Nutting*, Ca). Without locality (*Andersson*, St; *Bolander*, Wa; both *proc.*).

Rumex fenestratus differs from *R. occidentalis* by its twice as large fruiting perigonia and nutlets. In size and form of the leaves, whether crisped or not, and in outline of the valves, both species are variable.

The specimens from Vancouver Island are distinguished by the thick consistency of their leaves and by having their nerves papillose-pubescent beneath. I can not see the differences suggested by Greene in his descriptions concerning articulation of pedicels and outline of valves, or at least they are not sufficient to distinguish the insular and continental plants.

As to the relations between *R. fenestratus* and *R. occidentalis*, and the geographic distribution, see the discussion of the latter species.

Two forms seem to deserve separation:

Var. **procerus** (Greene) Rech. f., comb. nov.—*R. procerus* Greene, Pittonia 4: 305. 1899–1901. Differt a typo caulibus usque duplo longioribus et crassioribus, inflorescentia ampliore, valvis subminoribus.

This variety is limited to the western middle sections of California, that is, to the most southwestern part of the area of *R. fenestratus*. It occurs there "in wet, boggy depressions among the coast hills, about San Francisco Bay and Monterey," in exceedingly low localities compared with the extremely southern situation. The distinction from the type does not seem to be very clear. (See above, the specimens marked "*proc.*")

Var. **labradoricus** Rech. f., var. nov.—Differt a typo imprimis valvis sublongioribus, ambitu saepe subtriangularibus, plerumque acutis.

This variety is not clearly distinguished from the type. It occupies the most eastern parts of Canada and is separated from the principal area of the type by a large zone inhabited by *R. occidentalis*. (See above, the specimens marked "*labrad.*")

Explanation of Figure 22, a.—Valves of *Rumex fenestratus*, 4 times natural size; Idaho, *Macbride* 3812.

36. **Rumex Patientia** L.

Somewhat similar to *R. crispus*, from which it differs by its usually taller habit, larger, pale green, not so distinctly crisped leaves, these broadest below the middle, petioles flat on the upper side, larger, more cordate valves with proportionately smaller grains and larger nutlets.

SYNONYMY: L. Sp. Pl. 33. 1753; Macoun 354. 1888; Trelease 82. 1892; Britt. & Brown 550. 1896; Gray 355. 1908; Rydb. R. 232. 1922; Tidestrom 160. 1925; Rydb. P. 279. 1932; Rech. f. Vorarb. 2 in Repert. Sp. Nov. 31: 246. 1933.

A rather polymorphic species, originally from southeastern Europe and Asia. Most American specimens belong to the subsp. *eu-Patientia* Rech. f. op. cit. 246, with only one valve grain-bearing; but some of them approach by the still larger fruiting perianths, with three grains of unequal size, the subsp. *orientalis* (Bernh.) Danser; cf. Rech. f. op. cit. 253.

CANADA: Waste places, Ottawa (*Macoun* 5876, O). Roadside and fields near Belleville (*Macoun* 23760, O; approaching *orientalis*).

DISTRICT OF COLUMBIA: Washington (*Steele*, Ko; approaching *orientalis*).

WISCONSIN: Blue Mounds (*Fassett* 2955, La).

IOWA: Fayette (*Fink*, G).

KANSAS: Waste places, Riley Co. (*J. B. Norton* 449, La, UW; approaching *orientalis*).

MISSOURI: Courtney, waste ground (*Bush* 9789B, NY).

UTAH: Lehi, moist bottom (*Goodding* 1167, Wa, La).

WASHINGTON: Waitsburg (*Horner* 184, P). Spokane (*Turesson*, La).

37. **Rumex crispus** L.

Stem straight, erect, without axillary branches; leaves cuneate at the base, wavy-margined; petioles somewhat canaliculate on the upper side; panicle elongated, the whorls usually dense and approximate, the pedicels about 1.5 times longer than the fruit; valves round-ovate, subcordate, the margin entire or minutely erose, usually with 3 equal or unequal grains, rarely with only one.

SYNONYMY: L. Sp. Pl. 335. 1753; Pursh 247. 1816; Campdera 95. 1819; Hook. 129. 1840; Meisn. apud DC. 44. 1856; Wats. 9. 1880; Macoun 416. 1883; Trelease 84. 1892; Britt. & Brown 551. 1896; Small 370. 1903; Piper 225. 1906; Gray 355. 1908; Woot. & Standl. 192. 1915; Rydb. R. 232. 1922; Jepson 292. 1923; Tidestrom 160. 1925; Rydb. P. 280. 1932; Rech. f. Vorarb. Monogr. Rumex 3: 44. 1933.

A polymorphic species as to the form of leaves, size of fruiting perigonia, grains, etc.

Indigenous in Europe and Asia, introduced to all parts of the world and partly naturalized. In America students have generally assumed that it has only been naturalized, but, as the data cited from labels indicate, this seems open to question, especially as concerns those from the Rocky Mountains. In the following citations habitat for specimens noted by the collectors as from waste places or clearly as "weeds" has been omitted, only natural habitats being cited.

NEWFOUNDLAND: Bushy cove, Bay of Islands, garden (*Waghorne*, Z). Valley of Exploits River, low, damp clearings, Grand Falls (*Fernald & Wiegand* 5333, Ke). Region of Humber Arm, Bay of Islands, Summerside (*Fernald & Wiegand* 3285, G).

NOVA SCOTIA: Main Station (*H. St. John*, Ko, Ke).

ONTARIO: Kingston (*Fowler*, Wa).

ALASKA: Juneau (*Anderson* 2A-163, L). Treadwell (*Dicht*, NY). Kodiak, Sitkalidak Island, on seashores, Port Hobron (*Eyerdam* 123, 129, L, MW). Fairbanks (*J. P. Anderson* 1288, MW).

NEW HAMPSHIRE: Philbrook Farm, Shelburne (*Deane*, Wa).

MASSACHUSETTS: Amherst (*Sturns*, Wa). Mt. Washington (*Meredith*, St). Marblehead (*Harper*, P).

CONNECTICUT: Vicinity of Green's Farms (*Pollard* 74, Wa).

NEW YORK: Vicinity of Clove, Dutchess Co. (*Standley & Bollman* 12338, Wa).

DELAWARE: Greenbank (*Commons*, NY).

MARYLAND: Below Great Falls, Bank of C. & O. Canal (*Maxon* 6331, Wa).

VIRGINIA: Open woods below Potomac Falls (*Norton* 268, Wa). Norfolk (*Kearney* 1280, Wa). Suffolk, Nansemond Co. (*Heller* 961, Wa). Brancheville, Southampton Co. (*Heller* 961, Bo).

NORTH CAROLINA: Ocracoke Isl., Hyde Co. (*Kearney* 2295, Wa).

GEORGIA: McDuffie Co., along small stream in the open northwest of Thomson (*Bartlett* 2595, Wa). Savannah (*Kolthoff*). Savannah, Chatham Co. (*Moldenke* 1189, St, SL).

ALABAMA: Dry, open prairies, Marion (*C. Mohr*, Wa).

OHIO: Jamestown (*Wooton*, Wa).

MICHIGAN: Vicinity of Michigan Biological Station (*F. C. Gates*, MW, Ch).

WISCONSIN: Yard, Green Bay (*Schuette*, SL). Madison (?, Ko). Mt. Hope, Grant Co. (*Williams*, NY).

ILLINOIS: Southern Lake Co. (*Buhl* 640, MW). Cook Co. (*H. N. Smith* 5650, Bu). St. Clair Co. (*Eggert*, Le).

IOWA: Fayette Co. (*Fink*, Wa). Ames (*Ball & Combs* 513, Ko). Ames, Watkin's Well (*Kellogg* 46, Wa).

SOUTH DAKOTA: Deadwood, creek banks (*Rydberg* 5, NY, NW, Wa).

MISSOURI: Jerome (*Kellogg* 516, Wa). Springfield (*Standley* 8431, Wa). Courtney (*Bush* 9791, Ke). St. Louis (*Egeling*, Bu).

ARKANSAS: Without locality (*Rafinesque*, De).

KANSAS: Pittsburg (*Rydberg & Imler* 184, NY). Hoisington (*Rydberg & Imler* 1293, NY).

MISSISSIPPI: Columbus (*Mohr*, Wa). Starkville (*Tracy*, SL).

LOUISIANA: New Orleans (*Drummond* 282, Lu, Ke, MW). Gretna (*Ball* 334, SL, Ca, Wa). New Orleans (*Mellichamp*, SL).

TEXAS: Denison (*Reverchon*, SL). Reunion (*Reverchon*, SL). Dallas (*Reverchon*, SL). Victoria (*Eggert*, SL). Canyon, Randall Co. (*Palmer* 14013, SL). Austin, flood plain of Colorado River (*Armer*, Wa). Rio Grande Valley, Canutillo (*Barlow*, Ch).

MONTANA: Kalispell (*Blankinship*, SL). Low thickets along Swiftcurrent Creek, below Lake McDermott, 1,350 meters (*Standley* 15539, Wa).

WYOMING: C Y Ranch (*A. Nelson* 615, SL). Laramie, Albany Co., loose, rich soil (*Nelson* 8196, SL). Dry, open ground near Laramie, 390 meters (*C. J. Goodman* 867, SL).

COLORADO: Boggy pastures, 1,650 meters, Paradox, Montrose Co. (*Walker* 342, Be, Wa). Grand Junction (*Hedgcock*, SL). Colorado Springs (*Trelease*, SL). River bottom, Brighton (*Johnston* 524, SL). Woods along creek, Boulder, 1,530 meters (*H. C. Hanson* C464, SL). Ft. Collins, 1,500 meters (*J. H. Cowen*, SL). Mesa Verde (*Schmoll* 1788, La).

NEW MEXICO: Chama (*Baker* 295, Wa, SL, Bo). Mangas Springs, 18 miles northwest of Silver City, Grant Co., 1,430 meters (*Metcalfe* 157, Ke, SL). South end of Black Range, 1,650 meters (*Metcalfe*). Pecos River (*Coghill* 86, SL). Mesilla Park, Experiment Station Farm (*Standley*, SL). Near Pecos, San Miguel Co., 2,010 meters (*Standley* 5308, SL). Pecos National Forest, Winsors Ranch, 2,520 meters (*Standley* 4267, SL). Santa Fe (*Mulford* 1307, SL). Sandia Mts., Balsam Park, 2,460 meters (*Ellis* 259, SL). Vicinity of Ensenada, Rio Arriba Co., creek bottoms (*Standley & Bollman* 11087, Wa). Crains Ranch (*Wooton*, Wa). White Mts., Lincoln Co. (*Wooton & Standley*, Wa).

WASHINGTON: Wenatchee, Kittitas Co. (*Whited* 1252, Wa). Egbert Spring, Douglas Co., 390 meters (*Sandberg & Leiberg* 400, Ko, St, Ke, P, SL, Wa). San Juan Islands, Friday Harbor (*Zeller* 944, SL; 942, NY). Seattle (*Piper* 698, Lu, SL; *Zeller*, SL; *Bardell*, SL; *Freiberg*, SL; *Mosier*, Wa). Pierce Co. (*Davison*, P). Columbia Co. (*Darlington*, P).

OREGON: Shirk, low grounds in water, 1,500 meters (*Leiberg* 2587, Wa, St). Klamath Indian Reservation (*Coville* 1532, Wa). Shore of Klamath Lake, near Modoc Point (*Coville* 1333, Wa). Riddles (*Ward* 67, Wa). Willamette Heights, Portland (*Sheldon*, SL). Marion Co., Bush's Pasture (*Thompson* 4900, SL). Bank of small stream northeast of Brownsboro, Jackson Co., 720 meters (*Applegate* 2396, Wa; young specimen).

IDAHO: Forest, Nez Perce Co., 1,050 meters (*Heller* 3481, Ca, SL). New Plymouth (*Macbride* 240, P, SL, Wa). Camas Prairie, Blaine Co., meadow, 1,710 meters (*Macbride & Payson* 3822, SL). Coeur D'Alene Mts., divide between Mullon and Canyon Creek, 1,200 meters (*Leiberg* 1504, SL). Hailey (*Henderson* 3361, Wa). Boise, 840 meters (*Clark* 122, SL, St). Boise (*Mulford*, SL). Wet meadows, shores of Lake Pend d'Oreille (*Leiberg* 563, SL).

NEVADA: Kings Canyon, Ormsby Co., 1,700–2,000 meters (*Baker* 1201, SL, Ca, Bu). On slopes, Glenbrook on Lake Tahoe, 1,860 meters (*Tidestrom* 10293, St). Corey Canyon, Wassuk Mts., 2,040

meters (*Tidestrom* 10123, SL). Reno, 1,350–1,500 meters (*Hitchcock* 440, Wa).

UTAH: Grand River Canyon below Moab, 1,500 meters (*Rydberg & Garrett* 8492, Wa). Wasatch Mts., 1,650 meters (*Tidestrom* 547, Wa). Provo, 1,350 meters (*Jones* 5504, Wa, Ca, SL). Murray (*W. W. Jones*, Ca). Alta, Wasatch Mts., 2,700 meters (*Jones* 1183, Br, SL, Be, MW). Salt Lake City, 1,290 meters (*Jones* 2066, Bo, Bu). Salt Lake City, dry soil (*Pammel & Blackwood* 3611, SL).

ARIZONA: Pinal Creek (*Toumey* 3438, Wa). Chiricahua Mts., Miss Rhoda Rigg's Ranch, 1,650 meters, in running water (*Blumer* 1895, NY, Wa). Tucson (*Toumey*, Ca, Wa, NY). Santa Cruz bottoms near Tucson (*Griffiths* 4064, SL). Prescott (*Toumey*, Ca). Oak Creek (*W. W. Jones*, Ca). Rincon Mts. (*Toumey* 280, NY). Rincon Mts., Spud Ranch (*Blumer* 3497, Ca). Temple (*Griffiths* 4334, SL). Bisbee, along creeks (*Goodding* 1095, Wa, NY). Lower Miller Canyon, Huachuca Mts., moist, sandy ground (*Goodding* 188, NY). Flagstaff, 2,100 meters (*McDougal* 115, Be). Roosevelt (*Peebles, etc.*, 5213, Wa).

CALIFORNIA: Gualala, Mendocino Co. (*Taylor*, Ca). Near Comptche, Mendocino Co. (*Walker* 260, Ca). North Coast Ranges, Mendocino, Humboldt, and Del Norte Cos., between Camp Grant and Pepperwood (*Davy & Blasdale* 5487, Ca). Mendocino Co., Big River (*McMurphy* 237, NY; var. *advena* Danser?). Warner Mts., Modoc Co., 1,380 meters (*Taylor & Bryant*, Ca). Big Valley near Lookout, Lassen Co. (*Nutting*, Ca). Lassen Co., Honey Lake Valley, wet, adobe meadows (*B. Davy* 3378, Ca). Near Redding, Shasta Co. (*Heller* 7875, Ca, MW). Mt. Shasta and vicinity, Siskiyou Co. (*Palmer* 2524, Wa). Siskiyou Co., along creek near Yreka (*Butler* 513, 971, Ca, Wa). Valley of Van Duzen River, opposite Buck Mt., 300 meters, Humboldt Co. (*Tracy* 2806, Ca). Meadows on mountain side, 3 miles northwest of junction of Willow Creek with Trinity River, Humboldt Co., and near Beebe's Ranch, 900 meters (*Tracy* 3375, Ca). Santa Cruz Mts., Santa Clara Co., north embankment of Lake Lagunita (*Dudley*, Br). Santa Clara Co., foothills west of Los Gatos (*Heller* 7303, Ca). Little Chico Canyon (*Austin* 1937, Wa, SL). Santa Cruz (*C. H. Thompson*, SL). Boulder Creek, Santa Cruz Co. (*Walker* 743, Ca). Amador Co., vicinity of Ione, 60–150 meters (*Braunton* 1069, Ca, SL). San Francisco (*Harford & Kellogg*, SL). San José (?, Ca). Vicinity of Oakland (*Holder, Geol. Surv.* 2597, Wa). Berkeley (*H. A. Walker* 492, Ca; *B. Davy*, Ca; *Blankinship*, SL). Benicia (*Chandler* 7000, Ca). Crystal Spring Lake, San

Mateo Co. (*Elmer* 4266, NY, Be). Pine Grove, 660 meters, Amador Co. (*Hansen* 1794, SL, Be). Yosemite Valley, Transition Zone, 1,200–1,350 meters (*Abrams* 4639, Ca; *Hall* 9031, Ca). Panamint Canyon, Lower Sonoran Zone, 600 meters (*Hall & Chandler* 7043, Ca). Butte Co., Sierra Nevada at Chico Meadows, 1,200 meters, yellow pine belt, in wet turf, associated with *Senecio, Salix, Castilleja, Epilobium,* and *Sisyrinchium* (*Heller* 11595, Ca). Butte Creek, Butte Co. (*Austin* 632, Wa). Forest Ranch, Butte Co. (*Austin,* SL). Mt. Pinos, Ventura Co., Lockwood Valley, Upper Sonoran Zone, 1,560 meters (*Hall* 6696, Ca). By ditch near Weldon, Kern Co., 810 meters (*Wheeler,* Ca). San Bernardino Ranch, Mexican boundary (*Mearns* 637, Wa). San Bernardino (*Parish,* SL). Grant Lake City (*Scheuber,* Wa). San Luis Obispo Creek (*Guirado* 694, Wa). Soldiers Home (*Adams* 19, Ca). Orcutt (*Russell* 2216, SL). Avalon, Santa Catalina Isl. (*Trask,* Wa, Ke). Santa Cruz Isl., Prisoner's Harbor (*Adams & Wiggins* 123, Ca). Mecca, 57 meters (*Parish* 8617, Ca). San Jacinto Valley (*Reinhardt,* Ca). Jacinto Hot Springs (*Mearns* 3335, Wa). Los Angeles (*E. D. Palmer,* Ca). Claremont, Los Angeles Co. (*Burnett,* SL). Pasadena (*Grant* 1139, Wa). Antelope Valley (*B. Davy* 2279, Ca). San Antonio Mts., head of San Antonio Canyon, open ground along streams, Upper Transition Zone, 2,400 meters (*Johnston,* Ca). San Joaquin Co. (*Berg,* Ca). Head of San Joaquin Valley, green field near Bakersfield (*B. Davy* 1838, Ca). Owens Valley and Fort Tejon (*Geol. Survey,* Wa). Fort Tejon (*B. Davy,* 2380, Ca). Laguna (*Schoenfeldt* 368, Wa). Antioch, Contra Costa Co. (*B. Davy* 976–977, Ca). Jersey Isl., Contra Costa Co. (*Wiggins* 4605, Ca). Rumsey, Yolo Co. (*Tracy & Storer,* Ca). Near Norman, Glenn Co. (*B. Davy,* Ca). Glenn Co., Bennet Spring, on Newville road (*Heller* 11539, NY). Suisun (*H. A. Walker* 990, Ca). Santa Ysabel (*Henshaw* 3, Wa). Hayward (*Jepson,* Ca).

MEXICO: Orizaba (*Botteri* 109, Wa, Ke). Orizaba (*C. Mohr,* Wa). In graminosis, Huatusco, Veracruz (*Mohr,* Wa). Sianori, Durango (*Ortega* 5352, Wa). San Ramón, Durango (*Palmer* 156, Wa, G). Hidalgo, Tula, 2,040 meters (*Pringle* 6584, Wa). San Lorenzo (*Liebmann* 699H, Ko). Chihuahua, near Colonia García in the Sierra Madre, 2,220 meters (*Townsend & Barber* 82, St, MW, Wa). Chihuahua, 1,300 meters (*Palmer* 97, Ch, Wa, G; 223, Ch, Wa, G). Ex convalli San Luis Potosí, in paludosis (*Schaffner,* Ke). In paludosis ca. urbem (*Schaffner* 907, Ke). Vallée de Mexico (*Bourgeau* 201, Be, Ke). Morales (*Schaffner* 903, Ke). Querétaro (*Bro. Agniel* 10481; *Agniel & Arsène* 10476, Wa). Cerro Guadalupe, 2,250 meters,

vicinity of Puebla (*Arsène* 92, Wa). Vicinity of Puebla, Laguna San Baltasar, 2,140 meters (*Arsène*). Vicinity of Puebla, Rancho Posado (*Arsène* 70, Wa). Laguna près de Morelia (*Arsène*, Ke). Laguna au nord, Morelia, Michoacán, 1,800 meters (*Arsène* 3017, Wa). Hermosillo, Sonora (*Rose, Standley & Russell* 12503, Wa). Nuevo León, Saltillo (*Gregg*, NH).

BERMUDA: Fields, Warwick Pond (*Brown & Britton* 345, NY, Ca). Harrington House (*S. Brown* 677, Ko).

HAITI: Marmelade, Dept. du Nord, 800 meters (*Leonard* 8389, Wa). Foleur road, vicinity of St. Louis du Nord (*Leonard* 14390, Wa). Massif des Echos, Pte. Riv. de l'Artibonite, Perodin, 900 meters (*Ekman* 3486, Wa).

JAMAICA: Farm Hill (*Orcutt* 3337, Ca).

PUERTO RICO: Prope Maricao ad ripam fluminis (*Lindau* 242, Wa). Road from Ponce to Adjuntas (*Underwood & Griggs* 731, Wa). Ad vias, Adjuntas (*Stahl*, Z). Prope Aibonito ad la Lima (*Lindau*, H). Sierra de Luquillo in reg. media montis Jimenes, in pratis (*Sintenis* 1522, Ke).

MARTINIQUE: St. Pierre, prairie, jardin (*Louis-Arsène* 197, NY).

38. **Rumex conglomeratus** Murr.

Lower leaves cordate at the base, plane; branches of the panicle divergent; whorls nearly all with a leaf, remote; pedicels usually not longer than the fruit; valves 2.5–3 mm. long, entire, each bearing a large grain.

SYNONYMY: Murr. Prodr. Fl. Gött. 52. 1770; Meisn. apud DC. 49. 1856; Wats. 9. 1880; Trelease 90. 1892; Britt. & Brown 551. 1896; Small 371. 1856; Piper 226. 1906; Gray 356. 1908; Jepson 292. 1923.

A weed of European origin, naturalized in extra-tropical parts of the New World.

BRITISH COLUMBIA: Vancouver Isl., Bamfield (*Anderson* 7223, P). Nanaimo (*Macoun* 83938, Ch).

VIRGINIA: Near Ocean View Station, Norfolk (*Coville* 3, Wa). Norfolk (*Curtiss*, Ch).

NORTH CAROLINA: In oriente . . . locis vastis (*McCarthy*, Wa).

ARIZONA: Hot Springs (*Toumey*, 343d, Wa). Phoenix (*Toumey* 343b, Wa).

TEXAS: Wet, sandy ground, Huntsville, Walker Co. (*E. J. Palmer* 12035, La, Ca, Br).

WASHINGTON: Seattle (*Piper* 627, P, SL). McGowan, Pacific Co. (*Spiegelberg* 636, P; form with longer pedicels). Whidbey Island (*Gardner* 257, P).

OREGON: Columbia Co., damp ground in city auto park, Clatskanie (*Thompson* 3723, SL). Newport, Lincoln Co., beach (*Spillman* 165, P). Ballast, Linnton, Portland (*Suksdorf* 1931, P). Hillsboro, Washington Co. (*H. H. Smith* 4098, 6031, P, Ch). "Plat B" (*Haydon* 244, Ch).

CALIFORNIA: Humboldt Co., Eureka, 0–150 meters (*Tracy* 3164, Ca). Siskiyou Co., along ditch near Yreka (*Butler* 514, Ca). Mendocino Co., near Comtche (*Walker* 373, Ca). Santa Clara Co. (*Demaree* 9202, SL). Mendocino Co., near Mendocino, sea level to 150 meters (*H. E. Brown* 840, SL, Ca). Near San Francisco (*Brandegee*, SL). Berkeley (*B. Davy* 721, Ca; *Blankinship*, SL). Saratoga, Santa Clara Co. (*B. Davy*, Ca). Boulder Creek, Santa Cruz Co. (*H. A. Walker* 771, Ca). Santa Cruz (*Anderson*, SL; *C. H. Thompson*, SL). Lake Co., Kelseyville, weed in waste places (*Blankinship*, SL). Amador Co., Clinton, 600 meters (*Hansen* 1747, SL). Amador Co., Ione, 60–150 meters (*E. Braunton* 1048, SL). Yosemite Valley (lower end), Transition Zone, 1,200 meters (*H. M. Hall* 9107, Ca). Los Angeles (*Miss E. D. Palmer*, Ca). San Joaquin Co. (*Sanford* 46, Ca). San Joaquin Co., Stockton, irrigating ditch (*Sanford* 27, Ca; 1548, SL). San Bernardino, wet places (*Parish* 11429, Ca, SL). San Bernardino Co., damp land, meadows, 300 meters, San Bernardino Valley (*Parish* 11429, Ca). San Mateo Co., Crystal Springs Lake (*Elmer* 4276, SL). Flats along San Mateo River near ocean, San Diego Co. (*Wiggins* 2987, Ca). Witch Creek, San Diego Co. (*Alderson*, Ca). San Luis Obispo Co., Santa Cruz Canyon (*Barber*, Ca). Santa Catalina Isl. (*Nuttall* 895, Ke). Avalon, Santa Catalina Isl. (*Trask*, Ke). Orcutt (*Russell* 2217, 2218, SL). San Jacinto Valley (*Reinhardt*, Ca). Mill Valley, Marin Co. (*Bioletti*, Ca). Mission Valley (*Brandegee*, Ca). Elsinore, moist soil (*A. J. M.*, Ca). Hayward (*M. A. King*, Ca). Sonoma Co., along Sonoma Creek, at foot of Mt. Hood (*Heller* 5770, SL). Sonoma Co., Bennett Valley, southeast of Santa Rosa (*Heller* 5660, SL). Claremont (*A. R. Davis*, SL). Without locality (*Austin* 125, SL).

MEXICO: Hidalgo, Tula, 2,040 meters (*Pringle* 6369, UW, Wa, NY, Ca, Be, H, M, Z; sub nomine *R. Berlandieri*). Michoacán, Morelia (*Arsène* 3332, Wa).

HAITI: Vicinity of Mission, Fonds Varettes, 1,000 meters (*Leonard* 3813, Wa).

39. **Rumex sanguineus** L.

Lower leaves cordate at the base, plane; branches of the panicle divergent, only the lower whorls with a leaf, all remote; pedicels about 1.5 times as long as the fruit; valves 3–3.8 mm. long, entire, only one with a grain, the others usually grainless.

SYNONYMY: L. Sp. Pl. 334. 1753; Pursh 247. 1816; Campdera 65 and 94. 1819; Hook. 130. 1840; Meisn. apud DC. 49. 1856; Macoun 417. 1883; Trelease 90. 1892; Britt. & Brown 551. 1896; Small 371. 1903.

Though this species is mentioned by many American authors as introduced from Europe, I have seen only one American specimen. Perhaps it has sometimes been confused with other species, especially *R. conglomeratus*.

OREGON: Auf fremder Erde (ballast) in Linnton bei Portland (*Suksdorf* 1699, P).

40. **Rumex Britannica** L. Figure 22, *b*

Perennis. Caulis validus stricte erectus, profunde canaliculato-sulcatus, saepe purpurascens, 60–160 cm. altus, infra inflorescentiam non ramosus. Ochreae bruneae maiusculae cito evanescentes. Folia basalia ambitu oblongo-lanceolata usque ad 50 cm. longa, ad 20 cm. lata, latitudine 3–4-plo longiora, in vel infra medium latissima, basi oblique truncata vel late cuneata raro rotundata, apice acutiuscula vel rotundata, subplana vel ± undata et margine insuper minute crenato-crispata, utrinque glabra et levia vel subtus ad nervos scabriuscula, consistentia in sicco crasse membranacea vel tenuiter coriacea rigidula; nervi secundarii foliorum fere recti vix curvati, a primario angulo ca. 60°–80° abeuntes, subtus valde prominentes. Petiolus foliorum basalium laminam ± aequans. Folia caulina inferiora e basi rotundata vel latiuscule cuneata lanceolata, latitudine ca. 4-plo longiora, basin versus latissima, apicem versus sensim angustata; petiolus latitudinem folii ± aequans. Folia caulina superiora anguste lineari-lanceolata subplana breviter petiolata. Rami inflorescentiae plerumque breves e basi arcuata leviter divergentes ± stricte erecti superiores singuli simplices, inferiores foliis suffulti saepe elongati saepe fasciculati plerumque terni iterum ramosi, paniculam angustam brevem vel elongatam in statu fructifero ± compactam formantes. Florum glomeruli multiflori omnes plerumque approximati fructificationis tempore contigui, pedicelli fructiferi validiusculi, in quarta circiter parte inferiore tenuiter articulati, basin perigonii versus

sensim paulo dilatati, perigonio maturo 1.5–2 (–2.5) -plo longiores. Perigonii foliola exteriora ovato-lanceolata latiuscula subobtusa, 2–2.5 mm. longa, basibus interiorum accumbentia. Perigonii folia interiora (valvae) in statu fructifero 4–6 mm. longa, 4.5–7.5 mm. lata, longitudine plerumque evidenter latiora, ambitu cordato- vel reniformi-rotundata basi ± late emarginata, apice rotundata vel latissime rotundato-acuminata, margine subintegra vel imprimis basin versus minute et irregulariter crenulato-denticulata, colore carneo-bruneo vel stramineo, iuniora saepe purpureo-suffusa, consistentia rigide membranacea. Valvae facie subaequaliter et valde prominenter reticulato-nervosae, omnes calliferae; nervi basi (quo ex callo excurrunt) saepe incrassati. Calli subaequales elongato-fusiformes, semper a basi valvae aliquantum remoti ideoque nervo mediano quasi stipitati, apice in nervum medianum acute transientes, dimidia longitudine valvae semper evidenter longiores, leves. Nux matura brunea 3.5 mm. longa, ca. 2 mm. lata, utrinque subaequaliter acuminata, in medio circiter latissima.

SYNONYMY: *R. Britannica* L. Sp. Pl. 334. 1753; Gray, Proc. Amer. Acad. 8: 399. 1870; Trelease 831. 1892; Britt. & Brown 550. 1896; Gray 355. 1908; Woot. & Standl. 192. 1915; Rydb. P. 280. 1932. *R. orbicularis* Gray, Man. ed. 5. 420. 1868; Macoun 415. 1883. *R. hydrolapathum* var. *americanus* Gray; *R. Britannica aquaticus* Pursh, Fl. 248. 1816. *R. acutus* Hook. Fl. 2: 130. 1840, non L. *R. sanguineus* Hook. Fl. 2: 130, p.p.

ILLUSTRATIONS: Trelease, *pl. 21.* 1892; Britt. & Brown 550. 1896 (very bad).

DISTRIBUTION: Lowland districts of Canada and eastern and middle United States.

NEWFOUNDLAND: Region of Humber Arm, Bay of Islands, brackish swamp (*Fernald & Wiegand* 3287, Ke, O; *borealis*).

NOVA SCOTIA: Sable Island, at Life Saving Station, swampy edge of fresh-water pond (*St. John* 1200, O, Wa, Ko; *borealis*). Bridgewater (*Macoun* 83951, O). Sable Island, very rare (*Macoun* 22595, O). Common in swamp, Boylston (*Hamilton* 24676, O). Digby (*Macoun* 83952, O). By a lake near Louisburg, Cape Breton Isl. (*Macoun* 20215, O).

NEW BRUNSWICK: Gloucester Co., brackish margin of Tête-à-Gouche River, Bathurst (*Williams & Fernald* 69122, O; *borealis*).

PRINCE EDWARD ISLAND: Marshes near Tracadie (*Macoun* 23695, O).

QUEBEC: Magdalen Isl., wet bogs and mossy pond margins among the sandhills between East Cape and East Point, Coffin Isl. (*Fernald, Long & St. John* 7329, NY, O, Wa, Ko; *borealis*). Ste. Thérèse, Lac Tourbeux (*P. Ls.-Marie*, MW). Tourbières de St. Hubert, vicinity of Longueuil (*Victorin* 9770, Wa). Ile du Bic, cordon littoral (*Rousseau* 30059, St; *borealis*). Saguenay Co., River Etamamion, Charny (*St. John* 90399, O; *borealis*). Along the Pêche River, above Wakefield (*Macoun* 60813, O). Low ground along brooks and in river marshes, mouth of the Restigouche (*Macoun*, O). Low ground near Matane Gaspé (*Macoun* 23694, O). Below Cap à l'Aigle, Port à Persis (*Macoun* 67752, O). In swamp, Granby (*Scott* 12905, O).

ONTARIO: High Park, Toronto (*Macoun* 54766, O). Wet places, Pt. Edward, River St. Clair (*Macoun* 23696, O). St. Patrick's Bridge, Ottawa (*Macoun* 5871, O). Marsh below Britannia (*Macoun* 83762, O). Swamp, Britannia (*Harrington* 1906, O). Moose Creek (*Macoun* 1568, O). Ottawa, Hemlock Lake (*Macoun*, O). Swamp near New Edinburgh (*Harrington* 1904, O). Georgian Bay (?, O). Brewery Creek below Chelsea Road (*Macoun* 83760, O).

MAINE: Mount Desert, Seal Cove (*Bicknell* 3932, NY). Mt. Desert, Eden St. Cove (*Bicknell* 3931, NY). Orchard, Aroostook Co. (*Fellows* 6904, Wa).

MASSACHUSETTS: Shore of Fishers Pond, West Tisbury, Martha's Vineyard (*Seymour* 1177, Wa, NY). Swamp, Natick (*Chamberlain & Knowlton*, Wa). Essex Co. (*Oakes*, Ke). Woburn, swamp (*Morong*, NY). Cottage City (*Curtis?*, Ha).

RHODE ISLAND: Olneyville (*Congdon*, Ch).

NEW YORK: Ithaca (*Coville*, Wa). Arlington (*S. F. Henser*, Be). Vicinity of Clove, Dutchess Co., marsh (*Standley & Bollman* 12163, Wa). Long Island, Suffolk Co., brackish marsh, White Brook, Southampton (*St. John* 2706, Wa).

NEW JERSEY: Budd's Lake, Sussex Co. (*J. K. Small*, Wa, Ko). Lake George (*Vasey*, Wa). Califon, Hunterdon Co. (*Fisher*, Wa). Stockholm (*van Sickle*, Wa).

MICHIGAN: Near Port Huron, St. Clair Co. (*C. K. Dodge*, St, Wa). Hubbardston (*Wheeler*, Wa).

OHIO: Cleveland, wet places (*Krebs* 584, Be). Perkins, Erie Co. (*Mosely*, Wa).

INDIANA: Swamps and marshes, Clarke (*Umbach*, Wa). Muncie (*Brady*, Ca). Pine (*Duesner*, Ch).

WISCONSIN: Without locality (*Schuette*, NY). Greenfield, in water (?, NY). Fort Howard (*Schuette*, Ch).

ILLINOIS: Peoria (*Mendel*, H). Ringwood (*Vasey*, UW).

MINNESOTA: Itasca Park, headwaters of Mississippi River, Clearwater Co., Iron Springs (*Grant* 3115 or 3175, Ca, NY). Fort Snelling (*Mearns* 829, Wa). Sandy Lake (*Sandberg* 808, Wa). Long Lake, Kandiyohi Co. (*Metcalfe* 2167, Wa).

IOWA: Kossuth Co. (*Cratty & Pammel* 584, Wa, Be). Wet ground, Fayette Co. (*Fink* 540, Wa). Hanging bog, 3 miles southwest of Laboratory, Lake Okoboji, Dickinson Co. (*Conard*, MW).

NORTH DAKOTA: Camp Lake, Underwood (*Metcalfe* 416, Wa).

SOUTH DAKOTA: Wet places along Sioux River, Brookings (*Williams*, Wa).

NEBRASKA: Cody's Lake at head of Dismal River, swamp (*Rydberg* 1670, Wa, Be). South Cody Lake (*Thomson* 227, Wa). Lomo, Keyapaha Co. (*Clements* 2896, Wa). Dewey Lake (*Thomson* 98,Wa).

Rumex Britannica is not related to any other American species but only to the European *R. Hydrolapathum* Huds. This relationship was already recognized by Gray, who called the American plant *R. Hydrolapathum* var. *americanus*. *R. Hydrolapathum* shows a similar nervation of leaves and also elongate and narrow valve grains, but is easy to distinguish by its longer basal leaves, of more leathery consistency, and by its triangular, acute valves.

The name *R. Britannica* is used here in the sense of Trelease and subsequent authors. The identity of this plant with Linné's *R. Britannica* is not clear to me. Earlier authors seem to have confused it with *R. altissimus* Wood. Perhaps it would be more cautious to use the name *R. orbicularis* Gray.

Mr. H. W. Pugsley of London kindly undertook to examine for me the specimen of *R. Britannica* in the Linné Herbarium. He wrote that the specimen deposited there under the name *R. Britannica* is not absolutely a type, because there is no evidence of the date at which it was inserted in the herbarium. It consists of a small branch with narrow leaves, without axillary branches. The fruiting pedicels are 7–15 mm. long and the valves triangular, about 5 mm. long and broad. These characters for the most part seem not to agree with *R. Britannica* of authors.

In the northeastern parts of its area (Nova Scotia, Quebec), *R. Britannica* occurs usually in a form differing in some respects

from the type. I am not sure whether this represents a geographic race or rather an occasional modification.

Var. **borealis** Rech. f., var. nov.—Differt a typo caule humiliore, saepe crassiore, panicula fructifera breviore magis compacta ramis paucis brevibus appressis vel subnullis, foliis multo minoribus proportione angustioribus, basi apiceque subaequaliter angustatis, consistentia crassioribus, in medio circiter latissimis, basalibus extremo apice saepe breviter rotundatis, valvis fructiferis sublatioribus, ad 8.5 mm. latis.

Specimens belonging to this variety in the list of specimens examined are noted as "*borealis*."

Explanation of Figure 22, b.—Valves of *Rumex Britannica* L., 4 times natural size, from *Macoun* 83951.

41. **Rumex obtusifolius** L.

Lower leaves broad, deeply cordate at base, flat, the upper rounded at base, narrower, lanceolate; branches of the panicle divergent; only the lower flower verticils with leaves and remote; pedicels slender, to 2½ times as long as the fruit, jointed near the base; valves 5–6 mm. long, usually one of them bearing a grain, with two or three often very pronounced teeth on each side.

Indigenous in Europe, introduced to North and South America, South Africa, eastern Asia, etc. The species is very polymorphic and is represented in Europe by four subspecies. Most of the American specimens belong to the West European subspecies *agrestis* (Fries) Danser (see Rech. f. op. cit. 1: 45), characterized by leaves somewhat papillous on the under side along the nerves and by large (about 6 mm.) fruiting perigonia with toothed segments, usually one of them bearing a grain. Only one specimen belongs to the Central European subsp. *transiens* (Simonkai) Rech. f. op. cit. 52, characterized by somewhat smaller fruiting perigonia with 3 usually unequal grains and shorter fruit segments.

SYNONYMY: L. Sp. Pl. 335. 1753; Pursh 248. 1816; Campdera 87. 1819; Meisn. apud DC. 54. 1856; Wats. 9. 1880; Macoun 412. 1883; Trelease 91. 1892; Britt. & Brown 552. 1896; Small 371. 1903; Gray 356. 1908; Woot. & Standl. 193. 1915; Rydb. R. 232. 1922; Jepson 293. 1923; Tidestrom 160. 1925; Rydb. P. 280. 1932; Rech. f. Vorarb. Monogr. Rumex 1: 41. 1932; Vorarb. 2: 46. 1933. *R. crispatulus* Michx. Fl. Bor. Amer. 1: 217. 1803; Campdera 88. 1819; Meisn.

apud DC. 59. 1856, fide Fernald apud St. John, Rhodora 17: 77. 1915. *R. Rugelii* Meisn. apud DC. 54. 1856.

BRITISH COLUMBIA: Near mouth of Downie Creek (*C. H. Shaw*, Bu, UW). Victoria (*Anderson*, P). Popensa, New Westminster (*Anderson* 180, P).

ALASKA: Juneau, near beach (*Anderson* 2A-285, Lu). Skagway (*Enander* in 1913, St). Sitka (*Eastwood* 958, G). Unalaska (*Hultén* 7532b, Lu, MW). Akutan (*Norberg*, Lu).

NEW HAMPSHIRE: Connecticut Lake (*Sturns*, Wa).

MASSACHUSETTS: Shade, border of woods, Mt. Washington, Berkshire Co. (*Meredith*, St). Swampscott (*Harper*, P).

NEW YORK: Penn Yan, Yates Co. (*Wright*, Le). Northville, Long Island (*H. W. Young*, Wa).

NEW JERSEY: South Amboy (*Kelsey* 188, La).

PENNSYLVANIA: Lancaster (*Heller*, De). Upper Susquehanna, Sayre (*Barber*, Be). Hyndman, Bedford Co. (*Small*, Ch). Paradise Falls, 270 meters (*Bernhardt*, P).

DISTRICT OF COLUMBIA: Potomac Flats (*A. Ruth*, NY).

MARYLAND: Open fields near Clinton (*T. Holm*, Br). Washington (*E. S. Steele*, De, UW).

VIRGINIA: Bedford Co. (*Curtiss*, St). White Top Mt. (*Rydberg* 8122, NY). Vicinity of Chain Bridge (*Van Eseltine & Mosely* 22, 34, Wa).

GEORGIA: Athens (*R. M. Harper*, UW).

FLORIDA: Waste ground, Tallahassee, Leon Co. (*Moldenke* 1173, St).

OHIO: Hamilton Co. (*Matthes*, Be). Jamestown (*Wooton*, Wa). Cincinnati (*Lloyd*, P).

TENNESSEE: In paludosis ad French Broad River pr. Dandridge (*Rugel*, Be).

ILLINOIS: (*Eggert*, Le).

MISSOURI: (*Engelmann*, Be). St. Louis (*Geyer*, MW). Vacant grounds, Missouri Bot. Gard. (?, Lu, UW). Butler Co. (*H. H. Smith* 599, Ch).

IOWA: Decatur Co. (*Fitzpatrick*, La).

LOUISIANA: New Orleans (*B. Matthes*, Lu, Be).

KANSAS: Cherokee Co. (*A. S. Hitchcock*, UW).

OKLAHOMA: Pottawatomie Co. (*P. I. White*, Lu).

COLORADO: Fort Collins (*I. H. Cowen*, Be, Lu, Up; 3832, P).

NEW MEXICO: Kingston, Sierra Co., 1,980 meters (*O. B. Metcalfe*, Be, De).

UTAH: Farmington Canyon, near Salt Lake City, 1,290–1,650 meters, low woods near springs, common (*Pammel & Blackwood* 3639, Z).

ARIZONA: Chiricahua Mts., Barfoot Park, 2,400 meters (*J. C. Blumer*, Be).

WASHINGTON: Montesano (*Grant*, P, Be, Lu). Camp Lewis, Pierce Co. (*Davidson*, P). McGowan, Pacific Co. (*Spiegelberg* 694, P). Snohomish (*Sprague*, P). Sequim (*Grant*, P). San Juan Islands, Friday Harbor (*Peck* 12902, 13056, P).

OREGON: Portland (*Kellogg & Hartford* 869, NY; *Suksdorf* 3206, P). Hillsboro (*H. H. Smith* 6032, 6044, Ch).

CALIFORNIA: Requa, Del Norte Co. (*Duncan* 354, La). Boulder Creek, Santa Cruz Co. (*Walker* 769, Ca). Shasta Co., east of Round Mt., Hatchet Creek, 1,200 meters (*L. Benson* 2227, SL, NY). Humboldt Co., Eureka, 0–60 meters (*Tracy* 4077, Ca). Near Ferndale, Humboldt Co. (*B. Davy* 6169, B, Ca).

MEXICO: Veracruz, Jalapa, 1,400 meters (*R. Endlich*, Be). Federal District, Valley of Mexico (*Pringle* 7488, G). Morelos, Cuernavaca, Montes Las Tres Marías, 3,000–3,200 meters (*Fröderstrom & Hultén* 231, St).

JAMAICA: Hardware Gap, 1,200 meters (*Harris* 10113, Wa).

42. **Rumex pulcher** L.

Lower leaves small, cordate at base, somewhat crisp marginally, often pubescent beneath; branches of the panicle very divergent, often intricate in fruit; flower verticils partly with leaves, all remote; pedicels thick, not longer than the fruit, jointed in the middle; valves toothed 4.5–6 mm. long, 2.5–4.5 mm. wide, usually all bearing a grain, but grains often of unequal size; nutlets 3–4 mm. long, broadest a little below the middle.

Indigenous in the Mediterranean Basin. Introduced to North and South America, South Africa, etc. The species is very polymorphic and is represented in the Old World by five subspecies. The American specimens belong to the following three: subsp. *eu-pulcher* Rech. f. (see op. cit. 1: 26), characterized by leaves usually contracted above the base (panduriform), by valves obviously longer than broad, with relatively long teeth; subsp. *divaricatus* (L.) Murb. (*R. brevipes* Meisn. apud DC. 55. 1856; see Rech. f. op. cit. 1: 35),

characterized by leaves usually not contracted and valves about as long as broad, with short teeth; subsp. *anodontus* (Hausskn.) Rech. f. (see op. cit. 1: 34), characterized by leaves usually not contracted and valves without teeth (or nearly so).

SYNONYMY: L. Sp. Pl. 336. 1753; Campdera 82. 1819; Meisn. apud DC. 58. 1856; Wats. 9. 1880; Trelease 91. 1892; Britt. & Brown 552. 1896; Small 371. 1903; Gray 357. 1908; Jepson 293. 1923; Rech. f. Vorarb. Monogr. Rumex 1: 25. 1932; Vorarb. 2: 46. 1933.

Subsp. **eu-pulcher** Rech. f.

VIRGINIA: Norfolk (*Ward*, Wa; no fr.; *Britton*, Ch). Virginia Beach (*Sudworth*, Wa). Williamsburg (*Grimes* 2692, NY; no fr.).

LOUISIANA: New Orleans (*Drummond*).

TEXAS: Columbia, Brazos River (*Bush* 208, NY; no fr.).

OREGON: Pasture, Port Orford (*Peck* 8467, NY; no fr.). Albina, Portland (*Suksdorf* 755, P).

CALIFORNIA: Humboldt Co., Alton, 30–90 meters (*Tracy* 3645, Ca). Seacoast at Shelter Cove, Humboldt Co. (*Bolander* 6568, Ca). Near Ferndale, Humboldt Co. (*Davy & Blasdale* 6171, Ca). Sonoma Valley (*J. Torrey* 422, SL). Pilarcitos Stone Dam, San Mateo Co. (*Elmer* 4778, Ca). Near Saratoga, Santa Clara Co. (*Pendleton* 222, Ca; no fr.). Pacific Grove, Monterey Co. (*Elmer* 4067, Ca; *Patterson*, Ca). Berkeley (*Blankinship*, Lu). San José (?, Ca; no fr.). Benicia (*Chandler* 6087, 6088, Ca). Oakland (*Davy*, Ca). Oak Park (*Unangst*, Ca). Chinese Garden, San Luis Obispo (*Condit*, Ca). Los Angeles Co., Inglewood, waste place (*Abrams*).

MEXICO: Valley of Mexico, 2,190 meters (*Pringle* 8518, Ca, St).

Subsp. **divaricatus** (L.) Murb.

FLORIDA: Moist, grassy field, Tallahassee, Leon Co. (*Moldenke* 1117, SL, St; no fr.). Tallahassee (*Harper*, Wa; no fr.).

LOUISIANA: New Orleans (*Drummond*, MW).

TEXAS: Sandy, open ground, Bryan, Brazos Co. (*E. J. Palmer* 11745, Ca, La, Br, MW). Low, sandy ground near bay, Morgans Point, Harris Co. (*Palmer* 11967, Ca, La, Br). Port Arthur, beach (*Kolthoff*, St). West of Troup (*Reverchon*, SL; no fr.). San Antonio (*Schulz* 2295, Ch).

CALIFORNIA: Los Angeles Co., Inglewood (*Abrams*, Ko). Pilarcitos Creek, San Mateo Co. (*Elmer*, SL, Wa, Be, MW). Sonoma Valley (*Torrey* 422, Wa, MW). Monterey (*Bailey*, Wa). "Flora

of California, Arizona, etc." (*Palmer*, Be, MW). Foothill region, Blue Oak and Digger Pine Belt, Copperopolis, Calaveras Co., 300 meters (*Tracy* 5598, Ca).

Mexico: San Angel (*Schiede*, Be). Vallée de Mexico (*Bourgeau*, Ke; no fr.). Mineral del Monte (*Ehrenberg*, Be; type of *R. brevipes* Meisn.). Hidalgo, wet places near Tula, 2,040 meters (*Pringle* 13180, Wa, Ke, Be, Ko, By). Mt. Orizaba (*Seaton* 365, Ch, G). Chinantla (*Liebmann* 699 E, Ko). Tiuzutlán (*Liebmann* 699, F, Ko).

Bermuda: Harrington House (*Brown*, Ko).

Subsp. **anodontus** (Hausskn.) Rech. f.

Texas: Austin (*Tharp* 1254, Wa). East of Country Club, Austin (*Bogusch* 571, Wa). Tarrant Co., moist ground (*Ruth* 1185, Wa).

43. **Rumex dentatus** L. ssp. **Klotzschianus** (Meisn.) Rech. f.

See Vorarb. 1: 19. Native of southern and eastern Asia. Introduced to America.

Oregon: Albina, Portland (*Suksdorf* 2761, 2843, 2906, P). Linnton, Portland (*Suksdorf* 1898, P). Multnomah Co. (*Suksdorf* 2952, P).

California: Stockton, San Joaquin Co. (*B. Davy* 1195, Ca).

44. **Rumex violascens** Rech. f. Figure 23

Planta annua vel biennis (vel interdum perennans). Caulis validus rarius gracilis ad 80 cm. altus in parte inferiore stricte erectus in parte superiore ± flexuosus tota longitudine canaliculato-sulcatus, saepe purpureo-suffusus, a medio (rarius iam infra) ramosus et florifer. Rami plerumque breves, arcuato-divergentes, a caule angulo ca. 45°–60° abeuntes, paniculam parvam apertam formantes. Ochreae albidae vel bruneae hyalinae. Folia omnia in vivo ut videtur subcarnosa in sicco crasse membranacea vel subcoriacea, plana vel margine crispula, glaberrima, ut tota planta levia. Nervi laterales foliorum a mediano angulo 45°–60° abeuntes. Folia basalia obverse lanceolata vel elongato-obovata, latitudine 2–4-plo longiora, supra medium plerumque latissima, supra basin saepe paulo panduriformi-constricta, basi late cuneata vel truncata, apice obtusa vel acutiuscula. Petiolus crassiusculus ad summum dimidiam longitudinem laminae aequans. Folia caulina inferiora et media basalibus similia sed minora et proportione angustiora et longiora et brevius petiolata. Folia summa parva anguste lanceolata utrinque angustata

breviter petiolata. Florum glomeruli plurimi remoti summi tantum in statu fructifero contigui, infimi tantum folio suffulti. Perigoniorum fructiferorum pedicelli validiusculi valvis aequilongi vel saepius 1.5 (–2) -plo longiores, prope basin incrassato-articulati, ab articulatione basin perigonii versus paulo dilatati ibique subinflato-incrassati. Perigonii foliola exteriora anguste lanceolata acuta, vix 1 mm. longa, basibus interiorum appressa. Perigonii folia interiora (valvae) in statu fructifero 2.5–3 mm. longa, 2–3 mm. lata, ambitu deltoidea vel triangulari-lingulata, apice acuta, margine basin versus utrinque irregulariter acute pluridentata, rarius subintegra. Valvae facie scrobiculato-nervosae, reticulo nervaturae valde prominente irregulari apicem valvae versus saepe ± evanescente. Valvae omnes calliferae; calli ± inaequales, maior 1.5–2 mm. longus, ± 0.75 mm. latus, ovatus, prominens, apice acute in nervum medianum valvae transiens, sub lente minute impresse punctulatus, interdum insuper transverse rugulosus. Nux brunea, 1.7 mm. longa, ± 1.2 mm. lata, vix infra medium latissima.

SYNONYMY: *R. violascens* Rech. f. Repert. Sp. Nov. 39: 171. 1936. *R. Berlandieri* Trelease 89. 1892; Small 370. 1903; Jepson 292. 1923; omnes saltem pro maiore parte, non Meisn.

ILLUSTRATION: Trelease 1892, *pl. 27* (only the fruiting branch and the left-hand leaf, as *R. Berlandieri*).

DISTRIBUTION: Western United States from California to Texas, and in Mexico; in low land, often on ditch banks.

TEXAS: El Paso (*Vasey*, Wa, Le; no fr.). Rio Grande, Presidio del Norte (*Havard* 111, Wa). Rio Grande Valley at Canutillo, El Paso Co. (*Barlow*, Ch).

NEW MEXICO: On the Rio Grande near Frontera (*Wright* 1780, 1781, Wa, Be). Valley of Rio Grande below Dona Ana (*Parry, Bigelow, Wright & Schott* 1173, Wa). Las Cruces (*Wooton*, Wa).

ARIZONA: Tucson (*Toumey* 342, 343a, Wa, Ca; *Evans*, SL). Phoenix (*Toumey* 343b, Wa; *Dewey*, Wa). Colorado Valley (*Palmer* 638, Wa, SL, Ch; no fr.). Catalpa (*McDougal* 751, Wa).

CALIFORNIA: Delano, Kern Co. (*B. Davy* 2430, Ca). Kern Delta (*B. Davy* 2146, Ca). Mesquite Lake, near Imperial, Colorado Desert (*B. Davy* 8024, Ca). Cameron Lake, Colorado Desert (*Brandegee*, Ca). Holtville, Imperial Valley (*Parish* 8078, La, Ca). Blue Lake, Imperial Valley (*Abrams* 3193, SL). Garner's Laguna (*Schoenfeldt* 2906, Wa). San Joaquin River, Lathrop (*Suksdorf* 53, P). "California, Arizona, etc." (*Palmer* 635 or 630, Be).

FIG. 23. *Rumex violascens* Rech. f.

MEXICO: San Lorenzo de Laguna and vicinity, 22–27 leagues southwest of Parras, Coahuila (*Palmer* 1182, Wa, UW, Paris; no fr.). Hermosillo, bed of Río de Sonora (*Maltby* 203, Wa; *Rose, Standley & Russell* 12463, Wa; dwarf specimen).

CULTIVATED: California, Berkeley (?, Ca).

INTRODUCED: Denmark: Amager, Paa Falleden (*Wiinstedt*, Ko).

This species has been identified by most American authors with *R. Berlandieri* Meisn. I consulted Meisner's type in the Berlin Herbarium, and pointed out that *R. Berlandieri* is not identical with the plant described here, but belongs to the subsection *Salicifolii*. *R. violascens*, on the contrary, is next related to *R. paraguayensis* Parodi; see Rech. f. Vorarb. 3: 33. As to the differences between *R. Berlandieri* and *R. violascens*, see the remarks under *R. Berlandieri*. The variability of *R. violascens* with regard to shape and breadth of leaves and outline and degree of denticulation of the valves is important, but since several characters never occur together, there is no reason to distinguish varieties.

Explanation of Figure 23.—Rumex violascens Rech. f., half natural size: (*a*) habit, Mexico, *Parry* 1173; (*b*) basal leaf, Arizona, *MacDougal* 751. Valves 4 times natural size, Arizona, *Dewey*.

45. **Rumex flexicaulis** Rech. f. Figure 24

Annuus vel biennis. Caules plerumque plures, ± graciles, flexuosi, e basi procumbente ascendentes, fistulosi, flavescentes vel brunnescentes, profunde sulcati, humiles, 15–40 cm. alti saepe iam infra medium ramosi et fructiferi, rami angulo acuto arcuato-divergentes, singuli simplices vel infimi iterum ramosi. Caules rami petioli folia subtus ad nervos papillis minutis albidis diu persistentibus, rarius evanescentibus obsiti. Ochreae bruneae membranaceae maiusculae. Folia omnia in sicco tenuiter membranacea, plana, nervi secundarii angulo 40°–60° a primario abeuntes. Folia basalia ignota. Folia caulina inferiora oblongo-lanceolata, basi subcordata vel ± late cuneato-contracta, apice acuta, latitudine 4–5-plo longiora. Petiolus latitudinem folii circiter aequans. Folia caulina media et superiora sensim minora angustiora basi magis angustata brevius petiolata. Panicula fructifera aperta, florum glomeruli multiflori, inferiores remoti, superiores contigui et valde compacti, omnes fere folio suffulti. Perigoniorum fructiferorum pedicelli validiusculi, prope basin articulati, ad basin perigonii subito inflato-dilatati, perigonio maturo plerumque evidenter breviores. Perigonii foliola exteriora lineari-lanceolata 1.3–1.5 mm. longa apice acuta basibus

FIG. 24. *Rumex flexicaulis* Rech. f.

interiorum appressa. Perigonii folia interiora (valvae) in statu maturo 3–3.5 mm. longa, 2.2–2.9 mm. lata, consistentia coriaceo-membranacea, colore atrobruneo-rufescenti, ambitu triangularia, basi truncata, apice in linguam acutiusculam protracta, margine basin versus utrinque 2–3 (–4) -dentata. Dentes parvi acuti irregulares 0.5 mm. (raro ad 1 mm.) longi. Valvae facie distincte reticulato-nervosae omnes subaequaliter calliferae; calli 1.2–1.6 mm. longi, 0.3–0.4 mm. lati, valde prominentes, anguste fusiformes, apice sensim in nervum medianum transientes, facie minute impresse cellulato-punctati. Nux matura brunea ± 2 mm. longa, ± 1 mm. lata, infra medium latissima, basi subbrevius, apice longius acuminata.

SYNONYMY: *R. flexicaulis* Rech. f. Repert. Sp. Nov. 39: 172. 1936.

MEXICO: Valley of Mexico, 2,190 meters (*Pringle* 9612, Wa). Bord des fossées près Mexico (*Bourgeau* 200, Ke). Chapultepec, auf feuchten Feldern (*Schaffner*, Ke). Without locality (*Schmitz*, MW; no fr.). Mexico City (*Orcutt*, 4073, Ch).

Specimens of this species have been distributed under the name *R. maritimus* L. *R. flexicaulis* is very distinct from the American and all the other representatives of the *Maritimi* by its broad leaves, large fruiting perigonia with short teeth, and large nutlets.

Explanation of Figure 24.—Rumex flexicaulis Rech. f.; half natural size; Mexico, *Schmitz*. Valves 4 times natural size; Mexico, *Bourgeau* 200.

46. **Rumex fueginus** Philippi. Figure 22, *c–g*

Annuus vel interdum biennis (aut perennans?). Caulis erectus vel adscendens, 15–60 cm. altus, strictus vel angulato-flexuosus, gracilis vel validus, subfistulosus brunnescens interdum purpurascens, ± tenuiter sulcato-striatus, papilloso-scaber glabrescens vel glaber, a medio vel a basi ramos fructiferos emittens. Rami angulo ca. 45° arcuato-ascendentes vel erecti, inferiores saepe elongati et iterum ramosi superiores ± abbreviati simplices. Ochreae albido-bruneae cito evanescentes. Folia omnia in sicco tenuiter vel crasse membranacea vel subcoriacea, nervis secundariis angulo ca. 60° a primario abeuntibus, margine ± undulato-crispa, glabra vel saepius—imprimis subtus ad nervos—pubescenti-scabra. Folia basalia linearilanceolata, basi leviter cordata vel truncata, supra basin saepe dilatata vel paulum panduriformi-constricta, apice acutiuscula, latitudine 5–7-plo longiora, petiolata; petiolus lamina brevior. Folia caulina media basalibus similia sed brevius petiolata, petiolus

latitudinem laminae ± aequans. Folia caulina superiora angustissime linearia subplana basi cuneata. Panicula fructifera ampla aperta in speciminibus macris interdum compacta. Florum glomeruli multiflori infimi tantum remoti superiores contigui, in statu fructifero saepe valde compacti, omnes folio suffulti. Perigoniorum fructiferorum pedicelli tenuissime setacei, prope basin tenuiter annulato-articulati, basin perigonii versus sensim paulum dilatati, perigonio maturo 1–2-plo longiores. Perigonii foliola exteriora anguste lanceolato-linearia, ca. 1 mm. longa, basibus interiorum appressa, apice acuta, saepe aliquantum recurva. Perigonii folia interiora (valvae) 1.7–2 mm. longa (apice incluso), 0.7–0.9 mm. lata (dentibus exceptis), subcoriaceo-membranacea, apice in linguam angustissimam acutam excurrentes, margine utrinque in dentes 2 e basi dilatata setaceo-subulatos tenuissimos divergentes, latitudinem valvae plerumque superantes fissa, facies angusta tota fere callo occupata nervatura itaque vix conspicua in dentes apicemque excurrens. Valvae omnes subaequaliter calliferae, calli ca. 1 mm. longi latitudine ca. 3-plo longiores valde prominentes apice obtusiusculi, facie tenuissime cellulato-punctati. Nux matura brunea, 1.3–1.4 mm. longa, 0.5–0.7 mm. lata, utrinque subaequaliter acuminata in medio circiter latissima.

SYNONYMY: *R. fueginus* Philippi, Anal. Univ. Chile 91: 493. 1895; Rech. f. Vorarb. 3: 35. 1935. *R. maritimus* L. var. *fueginus* Dusén, Sv. Exped. Magell. 3, No. 5: 194. 1900; St. John, Rhodora 17: 76. 1915. *R. maritimus* Meisn. apud DC. 59. 1856, p.p., non L.; Wats. 9. 1880; Coulter 318. 1885; Macoun 417. 1883; Rydb. R. 232. 1922, non L. *R. persicarioides* Pursh 248. 1816; Campdera 79. 1819; Hook. 130. 1896; Meisn. apud DC. 59. 1856; Trelease 93. 1892, Britt. & Brown 552. 1896; Small 371. 1903; Piper 226. 1906; Gray 357. 1908; Woot. & Standl. 193. 1915; Jepson 293. 1923; Tidestrom 760. 1925; Rydb. P. 280. 1932, non L.

ILLUSTRATIONS: Rhodora 17: *pl. 113.* 1915 (*R. maritimus* var. *fueginus*); Trelease 1892, *pl. 32* (as *R. persicarioides*); Britt. & Brown 552. 1896 (bad; as *R. persicarioides*).

DISTRIBUTION: Southern parts of South America and Andes of Ecuador; Canada; United States (southeastern states excepted).—Imperfectly developed Canadian specimens collected by Marie-Victorin and Rolland-Germain could, because the shape of the leaves is the same in both species, belong as well to *R. persicarioides* L.

PRINCE EDWARD ISLAND: Queen's Co., border of salt marsh, Bunbury (*Fernald, Long & St. John* 7340, Wa).

NOVA SCOTIA: Lagoon, Sable Island (*Macoun* 22594, Ch).

QUEBEC: Lac Constance (*Rolland* 10075, Ch, Wa). Ile d'Anticosti, Rivière La Loutre (Est), sur sable en marge du goulet (*Marie-Victorin & Rolland-Germain* 27231, Wa, St; 27284, Wa). Magdalen Isl., wet sands or mud at margins of brackish ponds southwest of Etang du Nord village, Grindstone Isl. (*Fernald, Long & St. John* 7339, O, Wa). Ile de l'Etang du Nord, Lagune de l'Etang du Nord (*Marie-Victorin & Rolland-Germain* 9768, Ch). Vallée de l'Ottawa, Lac Deschênes (*Rolland* 13016, Wa).

ALBERTA: Damp earth, ditch side, Craigmyle (*Brinkman* 786, Ch; 787, Wa). Border of marsh, north side of Bow River, Calgary (*Moodie*, Ch, Wa). Bow River, 1,350 meters, Actin Village (*Setchell & Parks*, Ca; dwarf specimen). Silver City (*Macoun* 23742, Ch). Banff (*McCalla* 2399, Wa).

SASKATCHEWAN: Prince Albert, Lat. 58° (*Macoun* 12914, Ch).

BRITISH COLUMBIA: Vancouver Island, Alberni Canal (*Macoun*, Wa). Nanaimo (*Macoun* 83930, Ch; approaching var. *tanythrix*).

RHODE ISLAND: Shores of Watch Hill Pond, Watch Hill (*Setchell*, Ca; approaching var. *tanythrix*).

WISCONSIN: Dry marsh, Delavan (*Hollister* 143, Wa). Silver Lake, Elkhorn, Walworth Co. (*Hotchkiss & Martin* 4399, UW; dwarf specimen).

ILLINOIS: Chicago, Stony Island (*Greenman* 2805, Wa; approaching var. *tanythrix*).

MINNESOTA: Fort Snelling, bank of Mississippi River (*Mearns*, Ch, Wa). Swan Lake, Nicollet Co. (*Metcalfe* 47, Wa). Shores, Sandy Lake (*Sandberg* 767, Wa). Itasca Co. (*Sandberg*, Ch). Ash Lake, Lincoln Co. (*Metcalfe* 1716, Wa). Tait Lake, Kandiyohi Co. (*Metcalfe* 2022, Wa). Anthony Park (*Schuette*, Ch). Geneva Lake, Freeborn Co. (*Shunk & Manning* 17, MW).

IOWA: Mud Lake (*Hitchcock*, Ca). Iowa Lakeside Laboratory, Lake Okoboji, Dickinson Co., along canal (*Conard*, MW).

MISSOURI: Without locality (*Bush* 8240, NY). St. Louis (*Engelmann*, St). St. Louis, bords du Mississippi (*Riehl* 464, MW). Missouri River, below Dampshire Rapids (*Ward*, Wa). Independence (*Bush* 58, Ca). Courtney, sandy bottoms (*Bush* 8240, Wa; 8240A, Ca; 8922, Ch).

ARKANSAS: Little Rock, sandy flood plain of Arkansas River west of Iron Mt. R. R. bridge (*Coville* 66, Wa).

NORTH DAKOTA: Mud Lake, Hankinson (*Metcalfe* 146, Wa). Leeds, Benson Co. (*Lunell*, Ch, Wa; partly *tanythrix*). Dickson (*Holgate*, Wa; approaching var. *tanythrix*). Lake Velva (*Mabbott* 444, Wa; *tanythrix*).

SOUTH DAKOTA: Iroquois (*Thornber*, Ca). Sandy beach of Missouri River near White River (*Geyer* 137, Wa). Cheyenne River (?, MW).

NEBRASKA: Red Willow Lake (*Thomson* 341, Wa; approaching *tanythrix*). Ballard Lake (*Thomson* 196, Wa). Middle Loup River, near Mullen, Hooker Co., rich meadow (*Rydberg* 1572). Pishelville, Knox Co. (*Clements* 2264, Wa). Wet places, Ashland (*Williams* Wa; partly approaching *tanythrix*). Crawford (*Webber*, Wa).

KANSAS: Manhattan (*Carleton*, Wa). Great Bend (*Benke* 5133, Ca, Ch). Stream banks, Riley Co. (*Pond* 1143, Wa). Bottomlands of Arkansas River south of Kendall (*Rydberg & Imler* 1003, NY).

MONTANA: Vicinity of Bozeman, wet ground (*Blankinship* 453, St, Wa). Harlowton (*Wooton*, Wa). Townsend (*Shear* 5238, Wa). Mountains south of Virginia City (*Allen ?*, Wa; *brachythrix*). Dried-up pool, Glacier Park Station, 1,440–1,530 meters (*Standley* 17663, Wa). Without locality (*Anderson*, Wa; *tanythrix*).

WYOMING: Damp soil along Buffalo River (*Merrill & Wilcox* 1176, Wa; *brachythrix*). Platte Canyon (*A. Nelson* 2757, St). Hutton Lake (*A. Nelson* 5290, Ca). Kendall, Sublette Co., margin of pond (*Payson* 2932, Wa, Ca). Yellowstone Park (*Mearns* 3497, Wa). Yellowstone Park, Turbid Lake (*Tweedy* 24, Wa). Shores of Two Ocean Lake, Teton Co. (*Williams* 1648, P). Yellowstone Park, in cacumine Electric Peak (*Enander*, St).

COLORADO: Denver, Sloan's Lake (*Eastwood* 105, Wa, Ca). Ft. Lupton, in swamp (*Johnston* 848, Wa). San Luis Valley, 1,920 meters (*J. Wolf* 1010[32], Wa; *brachythrix*). Texas Creek, 2,100 meters (*Brandegee*, Ca). Pueblo, Fremont Co. (*Brandegee* 947, Ca).

NEW MEXICO: Mangas Springs (*Wooton*, Ca; *Metcalfe*, Wa; *brachythrix*). Along ditches, Navajo Indian Reservation, Shiprock Agency, 1,425 meters (*Standley* 7262, Wa). Marsh, Jicarilla Apache Reservation near Dulce, 2,150–2,470 meters (*Standley* 8159, Wa). Gila (*Wooton*, Wa). Along ditch, Farmington, San Juan Co., 1,550–1,650 meters (*Standley* 6879, Wa; *brachythrix*). Mountains southeast of Patterson (*Wooton*, Wa; approaching *brachythrix*).

WASHINGTON: Spokane Co., Philleo Lake (*Suksdorf* 943, Wa, Ca). Spokane and Stevens Co., Mission (*Kreager* 484, 500, P, Wa). Little Spokane River, Dartford (*St. John* 9682, P). West Medical

Lake (*St. John* 6765, P). Whitman Co., Rock Creek above Rock Lake (*St. John & Warren* 6774, P; *Lake & Hull* 652, P). Revere (*St. John, etc.* 7143, P). Granite Point, Wawawai (*St. John* 3383, P). Snake River, Wawawai (*St. John* 6736, P). Southeast of Lamont (*Lackey*, P). *Typha* swamp northeast of Ewan, Whitman Co. (*Dillon, Pickett & Clarke* 349, P). Okanogan Co., Conconully (*St. John* 7741, P). Between Loomis and Tonasket (*Thompson* 7101, SL). Ophir (*Elmer*, P). Alma (*Elmer*, P). Beach at Golden Gardens, Seattle (*Thompson* 5123, SL; *tanythrix;* leaves with cuneate base). Coulee City (*Henderson*, P). Southland (*Spillman*, P). Clallam Co. (*Elmer* 2684, P). Bingen, Klickitat Co. (*Suksdorf* 11804, P). Whidbey Island (*Gardner* 256, P). Douglas Co., Egbert Springs (*Sandberg & Leiberg* 411, Wa, Ca). Alkali Lake, 330 meters (*Sandberg & Leiberg* 41, P).

OREGON: Deschutes Co., Crooked River near Smith Rock (*Whited* 416, P). Crooked River between Trail Crossing and Oregon (*Whited* 541, P). Portland (*Gorman* 3677, P). Silver Lake (*Henderson* 2423, P). Beach, Seal Rocks, Lincoln Co. (*Peck* 10695, Ch; fruits very small). "The Meadows," Wallowa Co., 1,275 meters, near spring on deserted ranch (*Sheldon* 8718, Wa, NY; *tanythrix*). Klamath Indian Reservation, Klamath Lake, near Modoc Point (*Coville* 1334, Wa). Upper Klamath Lake, 1,440 meters (*Leiberg* 711, Wa). Klamath Falls, Lake Ewana (*Lawrence* 1189, Wa).

IDAHO: St. Anthony (*Merrill* 482, Wa). Wet soil along irrigating ditch, St. Anthony (*Merrill & Wilcox* 1185, Wa; *brachythrix*). Falk's Store, Canyon Co. (*Macbride* 310, Wa, P, Ca). Granite Station, Kootenai Co. (*Sandberg, etc.* 778, Wa). Coeur d'Alene Mts., low meadows, Blue Creek, 750 meters (*Leiberg* 1326, Ca, Wa). Fernan Lake shore, Coeur d'Alene Mts. (*J. Rust*, Wa). Shores of Lake Pend d'Oreille (?, 559, Ca).

NEVADA: Carson Lake (*Tidestrom* 10776, Wa; *athrix*). Coleman Valley, 1,375 meters (*Coville & Leiberg* 109, Wa; *brachythrix*). Along beach, Walker Lake, near Hawthorn (*Tidestrom* 10148, Wa). Ruby Valley near Cave Creek, Elko Co., 1,800 meters (*Heller* 9526, Wa). Roadside, moderately dry, Battle Mt., 1,350 meters (*Hitchcock* 600, Wa; approaching *brachythrix*). Pah-Ute Mts., 1,500 meters (*Watson* 1052, Wa; *athrix*). Northwestern Nevada (*Bailey* 1053, Wa). Humboldt River, "au dessous des lacs" (*Rémy*, Paris; *athrix*).

UTAH: Vermillion, 1,620 meters (*Jones* 5839, Wa, Ca; *athrix*). Salt Lake City, 1,290 meters (*Jones* 1064, MW, Wa; *brachythrix*). Salt Lake Valley, 1,350 meters (*Watson* 1053, Wa; approaching

brachythrix). Rabbit Valley, 2,010 meters (*Ward* 598, Wa; partly *athrix*). Panguitch Lake, 2,520 meters (*Jones* 6015ax, 6002an).

ARIZONA: Road between Springerville and Fort Apache, Apache Co., 2,120–2,800 meters (*Eggleston* 15755, Wa; *brachythrix*).

CALIFORNIA: Humboldt Co., Stone Lagoon, marshy ground (*Tracy* 5867, Ca; partly *tanythrix*). Lassen Co., Willow Creek (*Baker & Nutting*, Ca). Siskiyou Co., saline flat, Butte Valley, 1,260 meters (*Butler* 1877, Wa, Ca; *brachythrix*). Lake shore (*Austin & Bruce* 2273, Ca). Fall River Lake, Shasta Co. (*Baker*, Ca). Castroville, Moss Landing, Monterey Co. (*Abrams* 4079, Ca). Shores of Clear Lake, Lake Co. (*Jepson*, Ca). Cache Creek, Lake Co. (*Bolander* 2261, Wa). San Francisco (*B. Davy* 1162, Ca; approaching *tanythrix*). San Francisco, "ad lacum Nuphar" (?, MW). San Francisco Co., Presidio (*Michener & Bioletti*, Wa). San Francisco, Lake Merced (*Rose*, Br; *tanythrix*). Puget Sound and San Francisco (*Capt. Wilkes* "1508," Wa). San Mateo Co., Crystal Springs (*Elmer* 4131, Wa). Laguna Canyon, frequent at edge of ponds (*Munz* 6346, Ca). Laguna, border of pond (*Munz* 2197, Ca). Laguna Canyon, lake shore (*Crawford*, Ca, SL). Los Angeles Co., Nigger Slough (*Braunton* 507, Ca, Wa). Los Angeles (*Brewer* 27, Wa; *brachythrix*). Bear Valley, San Bernardino Mts. and their eastern base, 1,950 meters (*Parish* 3059, Wa; 1508, Wa, Ca; *brachythrix*). Wet shore, Bear Lake, San Bernardino Co., 1,990 meters (*Munz* 10547, Ca). Mountain Lake (*Greene*, Wa; *tanythrix*). San Luis Rey (*Parry*, Wa; *tanythrix*). Hemet Dam (*Wilder* 794, Ca; partly approaching *brachythrix*). Wet places by Lake Merced (*Rose*, MW). Goose Lake Valley (*Austin* 159, Wa). Guadalupe (*Condit*, Ca). Oxnard, Ventura Co. (*B. Davy* 7804, Ca; *ovato-cordatus*). Without locality (*Frémont's Exped.* 426, Wa).

ECUADOR: In solo salso prope Salinas, Prov. Ibarra (*Sodiro*, Bu).

St. John has treated carefully the North American representatives of the *Maritimi* in Rhodora 17: 73. 1915. He comes to the following conclusions:

(1) The name *R. persicarioides* L. is very probably not to be applied to the most common North American plant as was done by Trelease and subsequent authors, but to a type limited to salt marshes and saline shores along the lower St. Lawrence and Richelieu rivers, characterized by the swollen, elliptic-ovate, straw-colored grains, not narrowed into the midrib of the valve.

(2) The most common North American type, with usually somewhat curled leaves, truncate or slightly truncate at the base, mostly named *R. persicarioides* since Trelease, is identical with the South American *R. fueginus* Philippi. As there are no remarkable differences in leaves and fruits between this plant and the Eurasian *R. maritimus* L., St. John calls the common American plant *R. maritimus* var. *fueginus*, as Dusén did.

(3) In the drier parts of the western United States occurs a form of *R. fueginus* differing from the type by the reduction or the complete lack of teeth on the margin of the valves. St. John calls this type *R. maritimus* var. *athrix*.

(4) The Eurasian *R. maritimus* with plane (not curled) leaves, cuneate at the base, has been found twice in the United States as an introduction.

(5) *R. crispatulus* Michx., by Trelease taken as a synonym of his *R. persicarioides*, is *R. obtusifolius* L. according to Fernald, who examined the type specimens (Fernald apud St. John, op. cit. 77).

The Gray Herbarium kindly lent me some specimens named by St. John as *R. persicarioides*, which I have compared with more than 150 sheets of *R. fueginus* from all parts of North America, and I can confirm his conclusions. In the reddish-brown color of the whole plant, especially of the fruiting perigonia, *R. persicarioides* agrees completely with *R. fueginus*. The length of the teeth of the valves is variable in both species, but in *R. fueginus* much more so than in *R. persicarioides*. This character, therefore, can not be considered diagnostic, as St. John believed, so the grain character remains the only distinction, since I could not find any differences in the vegetative parts. Nevertheless, I consider that this single character together with the geographic distribution is sufficient to maintain the two types as species.

I also agree with St. John in stating that the common North American type is identical with the South American. Slight differences in the length of the inner perigonium segments—those of the South American plants are usually somewhat longer—may be neglected. The occurrence of *R. fueginus* in Ecuador, recently pointed out by me (see note on page 137), suggests a link between the two remote parts of the area of *R. fueginus*. More localities for *R. fueginus* may still be found in the Andes.

I can not agree with St. John's taxonomic concept of *R. fueginus* as a variety of *R. maritimus*. The differences between *R. maritimus*

and *R. fueginus* in the papillosity and shape of the leaves, and in the color of the ripe fruiting perigonia, together with the existing but not tangible differences in the outline of the valves and with the geographical distribution, make a specific distinction necessary between *R. maritimus* and *R. fueginus*. There can be no doubt that *R. fueginus* is much more nearly related to *R. persicarioides* than to *R. maritimus*.

The variability of *R. fueginus*, in regard to habit, shape and texture of leaves, size of valves, and length of teeth, is considerable in both parts of the area, but greater in the northern one. In swamps the lower parts of the stem are often somewhat swollen or the stem is procumbent or ascending. Dwarf forms seem to occur on humid sand. In shady situations the whole plant becomes weak and tender. Some of the South American specimens show strongly curled leaves and more distinct papillosity of the vegetative parts. But no combinations of characters are fixed or limited to certain regions, so that the following varieties, very striking in extreme cases but connected by transitional forms, have but little taxonomic significance, except perhaps var. *athrix*.

Var. **athrix** (St. John) Rech. f.—*R. maritimus* var. *athrix* St. John; Tidestrom 160. 1925. Valvis integris.

Var. **brachythrix** Rech. f.—Valvarum dentes latitudinem valvae vix superantes; valvae et nuces saepe minores quam in typo.

Var. **typicus** Rech. f.—Valvarum dentes latitudinem valvae circiter 1.5–2.5-plo superantes.

Var. **tanythrix** Rech. f.—Valvarum dentes latitudinem valvae 3–4-plo superantes.

To the above it seems necessary to add a peculiar-looking plant, which I designate at present as var. **ovato-cordatus** Rech. f.: Differt a typo foliis caulinis inferioribus e basi leviter cordata late ovatis acutis, nervis secundariis angulo 70°–80° a primario abeuntibus, latitudine vix 1–1.5-plo longioribus. I saw only one sheet: California, Oxnard, Ventura Co. (*B. Davy* 7804). In the list of specimens examined the names of the varieties are added.

Explanation of Figure 22, c–g.—Valves 4 times natural size: (*c*) *Rumex fueginus* var. *athrix* (St. John) Rech. f., from *Jones* 5839; (*d*) var. *brachythrix* Rech. f., *Butler* 1877; (*e*) var. *ovato-cordatus* Rech. f., *Davy* 7804 (a basal leaf added); (*f*) var. *tanythrix*

Rech. f., *Sheldon* 8718; (*g*) a form with extremely small fruits, Leeds, North Dakota, *Lunell.*

47. **Rumex persicarioides** L. Figure 25

Planta annua. Caulis erectus, 10–50 cm. altus, strictus vel anguloso-flexuosus, gracilescens, fistulosus, tenuiter sulcato-striatus minute pubescenti-scaber, rufo-bruneus, a medio vel iam infra ramosus et fructifer. Rami fructiferi angulo ± 45° a caule abeuntes arcuato-divergentes, singuli, inferiores ± elongati iterum ramosi, superiores breves simplices. Ochreae parvae membranaceae cito evanescentes. Folia basalia e basi truncata vel subcordata lineari- vel oblongo-lanceolata. Folia caulina inferiora basi late cuneata vel truncata vel interdum subcordata basalibus similia, consistentia in sicco ± tenuiter membranacea, margine ± crispato-undata, apice acuta, latitudine 5–7-plo longiora, nervis secundariis angulo 45°–60° a mediano abeuntibus, imprimis subtus tenuiter pubescenti-scabra, petiolata. Petiolus latitudinem folii aequans vel interdum superans. Panicula fructifera ampla aperta. Florum glomeruli multiflori infimi remoti, superiores valde approximati in statu fructifero contigui, omnes folio suffulti sed folia apicem ramorum versus valde diminuta et vix prominentia. Perigoniorum fructiferorum pedicelli tenuiter filiformes, prope basin annulato-articulati, basin perigonii versus sensim paulum dilatati, perigonio maturo 1.5-plo longiores. Perigonii foliola exteriora anguste lanceolato-linearia, 1 mm. longa, basibus interiorum appressa, apice acuta. Perigonii folia interiora (valvae) in statu maturo apice incluso 2 mm. longa, dentibus exceptis ca. 1 mm. lata, consistentia subcoriaceo-membranacea, colore intense fusco-brunea, ambitu anguste lingulato-triangularia, basi non dilatata, apice in linguam angustissimam acutam excurrentes, margine utrinque in dentes duo subulato-setaceos tenuissimos elongatos latitudine valvae ca. 2-plo longiores paulum divaricatos fissa, facie reticulato-nervosa, nervis in dentes apicemque excurrentibus. Valvae omnes subaequaliter calliferae, calli ca. 1 mm. longi, prominentes, latitudine ca. 2–3-plo longiores, basi apiceque rotundata, facie tenuissime cellulato-punctati, valvae faciem omnino fere occupantes, colore in sicco aurantiaco. Nux matura brunea ca. 1.1 mm. longa, 0.5–0.6 mm. lata, basi brevius, apice longius acuminata, infra medium latissima.

SYNONYMY: *R. persicarioides* L. Sp. Pl. 335. 1753; St. John, Rhodora 17: 73. 1915; nec aliorum.

ILLUSTRATION: Rhodora 17: *pl. 113.* 1915 (*R. persicarioides*).

FIG. 25. *Rumex persicarioides* L.

DISTRIBUTION: Eastern Canada, Massachusetts, Oregon, California.

PRINCE EDWARD ISLAND: Prince Co., edge of brackish pond, Malpeque (*Fernald & St. John* 11038, G). Queens Co., border of salt marsh, Bunbury (*Fernald, Long & St. John* 7338, G).

NEW BRUNSWICK: Gloucester Co., wet sand behind beach, Miscou Harbor, Miscou Island (*Blake* 5577, Wa; no fr.).

QUEBEC: Temiscouata Co., Cacouna, margin of salt marsh (*Collins & Fernald*, G). Grèves de St. François de l'ile d'Orléans, près de la Pointe Est (*Marie-Victorin* 15766, G; var. *integerrimus*). Island of the Richelieu, Chambly (*Rolland & Victorin* 562, G). Iles de Madeleine, Grand Etang, Dune du Nord, Ile de la Grande Entrée (*Marie-Victorin & Rolland-Germain* 9769, Wa; no fr.). Bords de la lagune de l'Etang du Nord, Ile de l'Etang du Nord (*Victorin & Rolland-Germain* 9768, Wa; no fr.).

MASSACHUSETTS: Sandy shore and flats at north end of Tashomoo Lake, Tisbury (*Seymour* 1180, Wa, NY; 1462, Ca). Sandy margin, Poncha Pond, Edgartown (*Brooks*, Ca). Gloucester, sandy cove, Bay View (*E. F. Williams*, G).

OREGON: Newport, on sand on beach (*Spillman* 162, P). Beach, Seal Rock, Lincoln Co. (*Peck* 10591, Ch).

CALIFORNIA: Granada, San Mateo Co. (*H. A. Walker* 1539, Ca).

See St. John, loc. cit., for further citations of material.

Rumex persicarioides entirely agrees in vegetative parts with *R. fueginus*, so that flowering specimens from regions where both species are expected to occur can not be named. *R. persicarioides* differs from *R. fueginus* by somewhat narrower valves, rather elliptic (not triangular) in outline, and by thick, swollen grains, obtuse and not narrowed into the midrib. The grain is so large that only a narrow margin of the valve is visible.

Generally *R. persicarioides* is limited to the New England States and southeastern Canada, but St. John told me that he saw in the herbarium of Willamette University, Salem, Oregon, a specimen from Oregon belonging to this species, and I found one from California (*Walker* 1539) that shows the characters of *R. persicarioides* so clearly that I must take it for this species. It is distinguished from the eastern American specimens only by the valves and grains being somewhat larger and the teeth of the valves relatively shorter.

R. persicarioides differs from the Eurasian *R. maritimus*, which occurs in the United States very rarely introduced, by the papillose

pubescence of the stems and under side of leaves, by the (at least in dried state) reddish-brown color of the fruiting panicle, by the leaves being shortly contracted and truncate or subcordate at the base, frequently crisped at the margin, and by the large, swollen, rounded callosities occupying the larger part of the valves.

Explanation of Figure 25.—Rumex persicarioides L., half natural size; Massachusetts, *Seymour* 1180. Valves 4 times natural size: (*a*) Massachusetts, *Seymour* 1180; (*b*) California, *Walker* 1539.

48. **Rumex maritimus** L.

Very similar to the American *R. fueginus* Philippi, but differing from that by the complete lack of papillosity, the leaves flat and narrowed at the base, by the golden (never reddish-brown) color of the fruiting panicle, and by the shape of the valves.

SYNONYMY: L. Sp. Pl. 335. 1753; Meisn. apud DC. 59. 1856.

Indigenous in Europe and Asia, very seldom introduced to America. I saw only the following specimen:

NEW JERSEY: Hoboken, ballast filling (*A. Brown*, Wa).

49. **Rumex bucephalophorus** L.

Annual or biennial; stem low, usually with some spreading branches, glabrous; leaves small, ovate or lanceolate, cuneate at the base, acutish; pedicels to twice as long as the fruit, finally much thickened toward the base of the perianth and nearly clavate; valves to 2 mm. long, about 1 mm. broad, each of them with a minute callosity and 2–3 teeth on each side.

SYNONYMY: L. Sp. Pl. 336. 1753; Trelease 95. 1892; Small 96. 1903.

Originally from the Mediterranean basin, where it is conspicuously variable. In America found only once as introduced:

LOUISIANA: On ballast ground, Port Eads (*A. B. Langlois* 95).

HYBRIDS

1. **Rumex Britannica** L. × **crispus** L.

R. dissimilis Rech. f.

Differt a *R. Britannica:* Fructibus inaequaliter evolutis maioribus et minoribus mixtis, partim longissime partim brevius pedicellatis, callis inaequalibus partim ovatis, partim elongato-fusiformibus, foliis basalibus minoribus angustioribus subcrispatis.—Differt a *R. crispo:* Fructibus inaequaliter evolutis, valvis partim maioribus

margine denticulatis, callis multo longioribus, maculis nervaturae marginalibus partim valde elongatis, folio basali latiore subplano, nervis secundariis angulo fere recto a primario abeuntibus.

SYNONYMY: *R. Britannica* L. × *crispus* L. Repert. Sp. Nov. 40: 300. 1936.

MASSACHUSETTS: Plymouth, in a wet meadow (?, Up).

I have seen only the upper part of a fruiting specimen and one basal leaf. The panicle, because of the unequal size of the fruits and the unequal development of the grains, gives at once the impression of a hybrid. Most of the nutlets are compressible and may never have been viable. By the long pedicels, the orbicular valves, and the grains being at least in part extremely elongate, as well as by the lateral nerves of leaves forming nearly a right angle with the midrib, this plant resembles *R. Britannica*. The other parent species can only be considered a plant with not much shorter pedicels, valves all bearing grains, and shorter, narrower, crisped leaves. These characters are united in none of the indigenous North American species, but are found in *R. crispus*. This plant deserves special attention, as the only wild hybrid of an indigenous North American species.

2. Rumex crispus × obtusifolius

Differing from *R. crispus* by its broader leaves, somewhat cordate at the base, narrower valves with short teeth, and usually more slender habit, and from *R. obtusifolius* by the more or less crisped, narrower leaves and broader valves with shorter teeth. This hybrid is rather common in Europe and occurs also frequently wherever the parents grow together as naturalized. Pollen and fruits are usually sterile in large part. *R. obtusifolius* being represented as adventive mostly by the subsp. *agrestis*, the American specimens of the hybrid mentioned below belong to the combination *R. crispus obtusifolius* subsp. *agrestis*.

SYNONYMY: *R. crispo-obtusifolius* Meisn. apud DC. 54. 1856. *R. crispus* × *obtusifolius* Trelease 92. 1892; Rech. f. Vorarb. I, Beih. Bot. Centralbl. 49, 2: 94. 1932.

NEWFOUNDLAND: Region of Humber Arm, Bay of Islands, Birchy Cove (*Fernald & Wiegand* 3293, NY).

PENNSYLVANIA: (*Rothrock*, Ch).

DISTRICT OF COLUMBIA: Washington, near Potomac Depot (*Ward*, Wa).

OHIO: Mansfield (*Wilkinson*, Wa, Lu).

MICHIGAN: Sault St. Marie (*Harper*, P).

WISCONSIN: Oneida Res., Brown Co. (*Schuette*, Ch).

LOUISIANA: New Orleans (*Drummond* 282).

OREGON: Sauvies Island (*Howell*, Wa).

TEXAS: Huntsville, Walker Co. (*Palmer* 12034, Ca, SL, Br).

CALIFORNIA: Eureka, Humboldt Co. (*Tracy* 2543, Ca). Ferndale (*B. Davy* 6170, Ca). Shasta Co., border of Hatchet Creek, 1,200 meters (*Lyman Benson* 2227, SL).

HAITI: Massif de la Hotte, eastern group, Pt. Goave, Cap St. Michel, 1,000 meters (*Ekman*, Wa).

3. **Rumex crispus × pulcher** (see Rech. f. Vorarb. 1: 82)

BERMUDA: Fields, Warwick Pond (*Britton & Brown* 345, Wa). South Road (*F. S. Collins* 185, Ke, Wa).

VIRGINIA: Near Ocean View Station (*Coville* 3, Ke).

4. **Rumex dumosus × triangulivalvis**

I take from Danser's extensive descriptions the following remarks: "*R. adscendens* differt a *R. dumoso* habitu multo minus insolito, foliis subviridibus basi non dilatatis minusque crispis, ramorum evolutione finita, florum glomerulis partim efoliatis.—Originem e *R. salicifolio* indicant caules parte inferiore levi, folia lanceolata sublevia, absentia foliorum radicaliorum, pedicelli breves paulum incrassati, conspicue articulati et valvae triangulares membranaceae."

SYNONYMY: *R. adscendens* (*R. dumosus* × *salicifolius*) Danser, Nederl. Kruidk. Archief 1925: 470. 1926; Rech. f. Vorarb. 4: 50.

This hybrid grew in the Amsterdam Botanical Garden from seeds of *R. dumosus* which was cultivated in the neighborhood of *R. triangulivalvis*.

5. **Rumex paraguayensis × triangulivalvis**

I take from Danser's extensive description the following remarks: "Haec hybrida parentibus intermedia est et neutri parentis similis est. Habitus, folia radicalis obovata, foliorum margines crispi et racemi maxima pro parte foliati a *R. paraguayensi* veniunt. Folia autem angustiora acuta et, margine crispa excepto, levissima, racemi apice aphylli, valvae maiores, integrae vel fere integrae et color racemorum albidus sunt notae quas a *R. salicifolio* hereditate accepit hybrida."

SYNONYMY: *R. Goethartii* (*R. paraguayensis* × *salicifolius*) Danser, Nederl. Kruidk. Archief 1925: 463. 1926; Rech. f. Vorarb. 3: 51.

Danser obtained this hybrid from seeds of *R. paraguayensis*, which was cultivated in the Amsterdam Botanical Garden in the neighborhood of *R. triangulivalvis*.

AMERICAN SPECIES OF RUMEX NOT IDENTIFIED

Rumex americanus Campd. 151. 1819.

Rumex angustatus Raf. New Fl. N. Amer. 4: 53. 1836.

Rumex Claytoni Campd. 66, 99. 1819. Perhaps a synonym of *R. Britannica* L.

Rumex heterophyllus Raf. New Fl. N. Amer. 4: 52. 1836.

Rumex integrifolius Raf. loc. cit.

Rumex Kunthii Campd. 66, 97. 1819. *R. Kunthianus* Schult. f. Syst. 7: 1423. 1830. *R. longifolius* Kunth apud HBK. Nov. Gen. & Sp. 2: 180. 1817 (non *R. longifolius* DC.). Perhaps a synonym of *R. crispus* L.

Rumex ludovicianus Raf. Fl. Ludov. 30. 1817.

Rumex polygamus Sessé & Moc. Fl. Mex. 97. 1887.

Rumex Schultzii Raf. Med. Repos. N. Y. 5: 353. 1808. Nomen.

Rumex sylvaticus Raf. Amer. Nat. 12. 1820.

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